Certificate of Test

July 2006

TAIWAN SEMICONDUCTOR CO., LTD

Product Type : **Bluetooth Module**

Model Number : **BT-23, BT-234**

Test Report Number : **0607005 Rev. 1**

Date of Test : **June 30, 2006- July 05, 2006**

This Product was tested to the following standards at the laboratory of Global EMC Standard Tech. Corp., and found Compliance.

Standards:
FCC Part 15 Subpart C Paragraph 15.247
ANSI C63.4: 2003

http : //www.gestek.com.tw

Sharon Chang, President

Date: July 13, 2006

GesTek EMC Lab

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NEMKO

NVLAP 200085-0

Test Report
Application for Certification
On Behalf Of

TAIWAN SEMICONDUCTOR CO., LTD

EUT:

Bluetooth Module

Model Number:

BT-23, BT-234

FCC ID:
UES2006001

Prepared for:

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1. CERTIFICATION

Applicant : TAIWAN SEMICONDUCTOR CO., LTD

EUT Description	: Bluetooth Module
Model Number	: BT-23, BT-234
Serial Number	: N/A
Brade Name	: TSC
FCC ID	: UES2006001
Tested Power Supply	: 120V/60Hz

MEASUREMENT PROCEDURES USED:

☑ **CFR 47, Part 15**	Radio Frequency Device Subpart C Intentional Radiators :2005
☑ **ANSI C63.4**	Methods of Measurements of Radio-Noise Emissions from Low- Voltage Electrical and Electronic Equipment in the range of 9kHz To 40GHz. 2003

THE MEASUREMENT SHOWN IN THE ATTACHMENT WAS MADE IN ACCORDANCE WITH THE PROCEDURES INDICATED, AND THE MAXIMUM ENERGY EMITTED BY THE EQUIPMENT WAS FOUND TO BE WITHIN THE ABOVE LIMITS APPLICABLE.

NVLAP®
200085-0

Sample Received Date : **June 30, 2006**
Final Test Date : **July 05, 2006**

In order to ensure the quality and accuracy of this document, the contents have been thoroughly reviewed by the following qualified personnel from GesTek Lab.

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This test data shown below is traceable to National or international standard such as NIST/USA, etc. The laboratory's NVLAP accreditation in no way constitutes or implies product certification, approval, or endorsement by NVLAP or the United States government.

2. GENERAL INFORMATION

2.1 PRODUCTION DESCRIPTION

Product Name : Bluetooth Module
Model Number : BT-23, BT-234
Serial Number : N/A
Brade Name : TSC
FCC ID : UES2006001
Modulation Type : FHSS
Antenna Gain : 0dBi
Antenna Type : Ceramic
Type of Antenna joint Soldered on PCB
Frequencg Range : 2402MHz to 2480MHz
Channel Number 79 Channel
Data Rate 115200bps
Channel Control Control by Software
Working Voltage : DC +5V

Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2422	40	2442	60	2462
01	2403	21	2423	41	2443	61	2463
02	2404	22	2424	42	2444	62	2464
03	2405	23	2425	43	2445	63	2465
04	2406	24	2426	44	2446	64	2466
05	2407	25	2427	45	2447	65	2467
06	2408	26	2428	46	2448	66	2468
07	2409	27	2429	47	2449	67	2469
08	2410	28	2430	48	2450	68	2470
09	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

Note:

1. This device is a 2.4GHz RS232 interface Bluetooth module transceiver, and certification modular approval.
2. Test of channel was included the lowest、 middle and highest frequency in highest data rate and to perform the test, then record on this report.
3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
4. The device is a transceiver equipement to accordance with Part 15 regulations. The function receiving was under Declaration of Conformity and record of measurment in test report that the report number is 0607005FCC DOC.
5. The EUT has two model numbers, because of the requirement of marketing.

2.2 OPERATIONAL DESCRIPTION

The Transmitter of EUT is RS232 interface Bluetooth Module and powered by host equipment. This device have one ceramic antenna soldered on PCB. The other instruction, please look at user manual.

This device is certified modular approval. It is powered by DC power supply in testing and connected to notebook by RS232 cable. The notebook run “CSR BuleTest” test softwave to control channels of device.

This is FHSS modulation. The equipment enables high-speed access without wires to network assets. This adapter uses the Bluetooth protocol to enable wireless communications between the host computer and other computers, in the same way the computer would use an Ethernet adapter.

2.3 TEST MODES & EUT COMPONENTS DESCRIPTION

EUT: Bluetooth Module, M/N: BT-23, BT-234 **The EUT tested with Notebook PC. (DELL, M/N: Latitude D600 PPO5L)**	
Test Mode	**Mode 1**
	Transmit
Power Cord	2.5m

2.4 SUMMARY OF TEST PROCEDURE AND TEST RESULTS

Test Item	Applied Standard Section	Test Resut
Conduction Emission	15.207, ANSI C63.4 Section 7	Pass (refer to section 3.7)
Radistion Emission	15.209,15.247(d) ANSI C63.4 Section 8,13 & Annex I	Pass (refer to section 4.7)
Peak Power Output	15.247(b), ANSI C63.4 Section 13 & Annex I	Pass (refer to section 5.4)
Band Edge	15.247(d) , ANSI C63.4 Section 13 & Annex I	Pass (refer to section 6.6)
Occupied Bandwidth	15.247(a) , ANSI C63.4 Section 13 & Annex I	Pass (refer to section 7.4)
Channel Separation	15.247(a) , ANSI C63.4 Section 13 & Annex I	Pass (refer to section 8.4)
Dwell Time	15.247(a) , ANSI C63.4 Section 13 & Annex I	Pass (refer to section 9.4)
Hopping Channel	15.247(b) , ANSI C63.4 Section 13 & Annex I	Pass (refer to section 10.4)

2.5 CONFIGURATION OF THE TESTED SYSTEM

The FCC IDs/Types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

Device	No.	Configuration
21" COLOR Monitor	**M01-058**	Manufacturer : COMPAQ Model Number : PE1143-41 Serial Number : N/A BSMI ID : R31708 FCC ID : N/A Data Cable : Shielded, detachable, 1.5m, VGA Cable Power Cord : 3Pin, Shielded, Detachable, 1.5m
USB Mouse	**M02-223**	Manufacturer : Logitech Model Number : M-U48A BSMI ID : 4882A177 FCC ID : JNZ211360 Data Cable : Shielded, Undetachable, 1.5m
External USB 2.0 Hard Disk	**U02-065**	Manufacturer : TERASYS Model Number : F12-UF Serial Number : A0100215-34P0030 BSMI ID : 4912A002 Data Cable : Shielded, detachable, 1.5m AC Power Adaptor : YHI M/N:YS-1015-U12A BSMI ID:4872A185 Input:AC IN:100V 50/60Hz 35VA Output: DC +12V ,1.25A
Digital Video Camera Recorder (Digital 8)	**V01-004**	Manufacturer : SONY CORPORATION Model Number : DCR-TRV230 Serial Number : 380334 BSMI ID : N/A AC Power Adaptor : M/N:AC-L10B, S/N:60308774 Input:AC IN:100-240V 50/60Hz 23W Output:DC 8.4V/1.5A Battery Pack(Li-ion): M/N:NP-FM30 Input :DC 7.2V/5.0Wh
Printer	**P01-018**	Manufacturer : Hewlett Packard Model Number : 2225C Serial Number : 2548S40842 BSMI ID : 3892A957 FCC ID : BS46XU2225C Data Cable : Shielded, Detachable, 1.2m, Parallel Cable Power Cord : Non-Shielded, Detachable, 1.8m
DC Power Supply	**-----**	Manufacturer : Agilent Model Number : E3617A

Device	No.	Configuration
NOTEBOOK	**DELL NB 2**	Model Number : Latitude D600 PPO5L BSMI ID : R33002 Serial Number : 11444680576 C.P.U : Intel Pentium M 1.4G HZ DDR : PC2100 256MB F.D.D : N/A H.D.D. : Manufacturer : HITACHI 20.G M/N: IC25N020ATMR04-0, S/N:MRG157K1GJP9JH BSMI ID:D33082 CD-ROM : Manufacturer :DELL M/N:6T980-A01 BATTERY : Manufacturer :DELL Li-ion MODULE M/N:6Y270 RATING:14.8V 220mAh AC ADAPTOR : Manufacturer :DELL M/N: PA-1650-05D S/N:CN-05U092-71615-41K-58C3 INPUT:AC 100-240 V~1.5A 50-60HZ Shielded, Undetachable, 2.5m

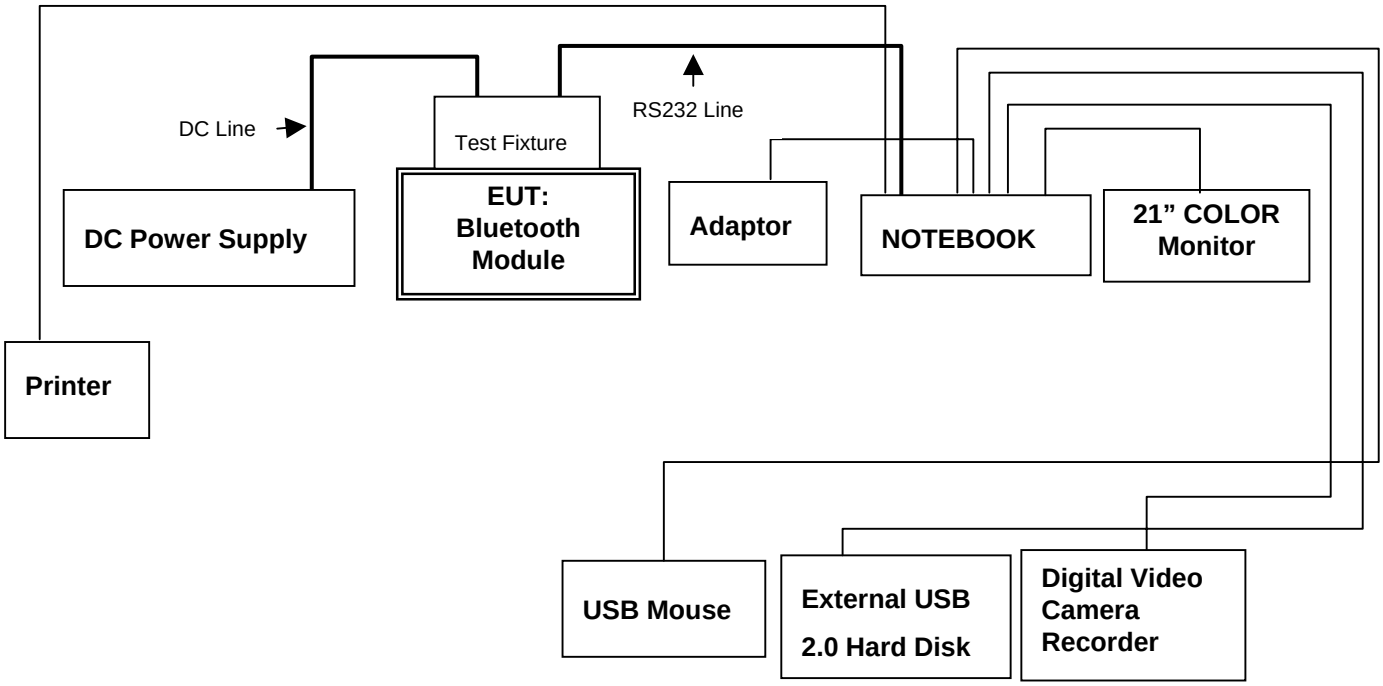
2.6 TEST FACILITY

Ambient conditions in the laboratory:

ITEMS	REQIORED
TEMPERATURE (°C)	15-35
HUMIDITY (%RH)	30-60
BAROMETRIC PRESSURE (mbar)	860-1060
FCC SITE DESCRIPTION	Aug. 10, 1995 /Aug. 25, 1998 File on FCC Engineering Laboratory Federal Communication Commission 7435 Oakland Mills Road Columbia, MD 21046 Reference 31040/SIT1300F2
NVLAP LAB. CODE	200085-0 United Stated Department of commerce National Institute of Standards and Technology National Voluntary Laboratory Accreditation Program Accreditation on NVLAP effective through Sep. 30,2006 For CISPR 22, FCC Method and AS/NZS CISPR 22 Measurement.
Chinese National Laboratory Accreditation Certificate R.O.C.	Recognized by the Council of Chinese National Laboratory Accreditation and confirmed to meet the requirements of ISO/IEC 17025 also has been registered for fifteen items, and meet the requirements of the Article 4 of Measures Governing the Recognition both Approval of Designated Laboratory for Commodities Inspection and has been registered for four items within the field of Electrical Testing. Registration No.: 1082 Registration on CNLA effective through April 30, 2006.

2.7 TEST SETUP

BLOCK DIAGRAM OF CONNECTIONS BETWEEN EUT AND SIMULATORS



2.8 EUT OPERATING CONDITIONS

The EUT exercise program used during conducted testing was designed to exercise the EUT in a manner similar to a typical use. The exercise sequence is listed as below:

1. Setup the EUT and simulators as shown on section 2.7.
2. Turn on the power of all equipments.
3. Run test softwave and confirm transmit mode of EUT.
4. Choose frequency required of standard and start testing.
5. Repeat the above steps.

3. CONDUCTION EMISSION DATA

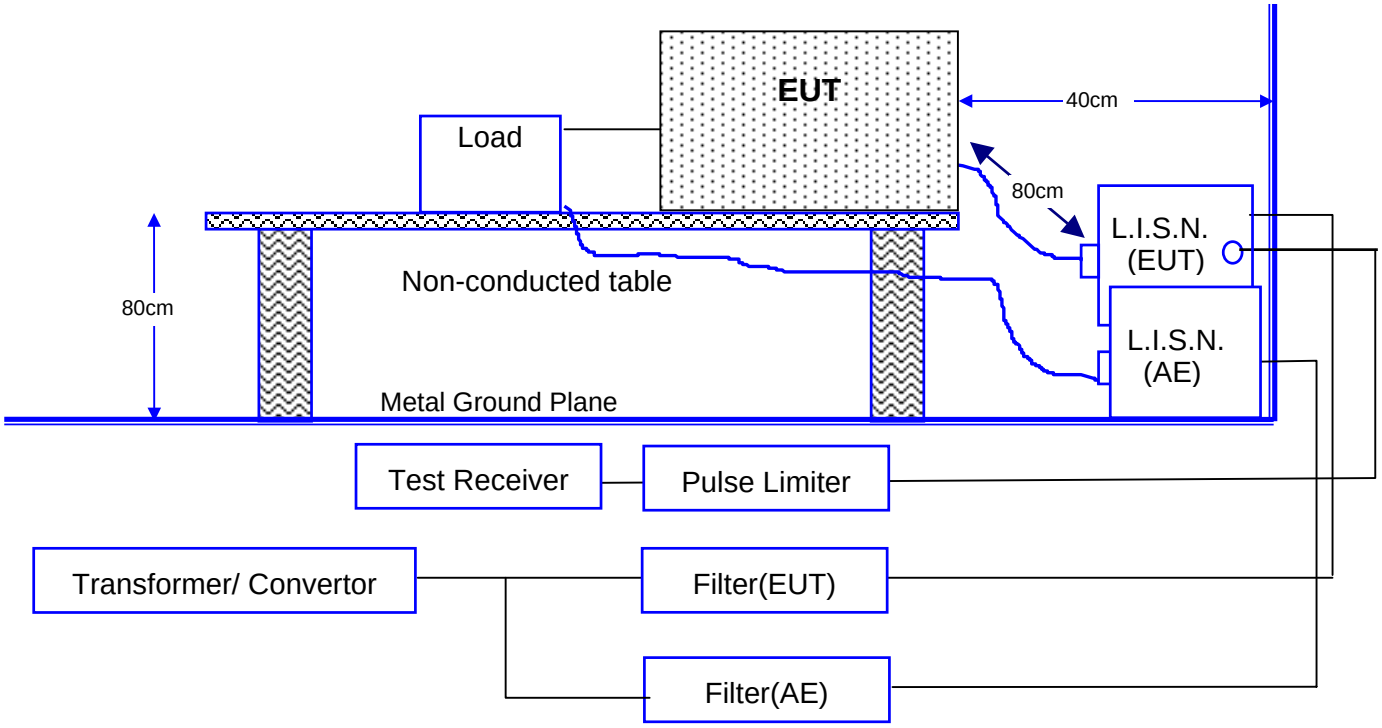
3.1 TEST EQUIPMENTS

The following test equipment are used during the conducted power line tests:

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Test Receiver	R & S	ESCS30	825022/003	06/08/06
2	LISN	ROLF HEINE	NNB-2/16Z	99042	12/20/05
3	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	357.8810.52	08/05/05
4	RF CABLE	GesTek	N/A	GTK-E-A152-01	12/20/05
5	50 Ohm Terminator	GesTek	N/A	GTK-E-A124-01	10/07/05
6	Shielded Room	GesTek	N/A	B5	N/A

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

3.2 BLOCK DIAGRAM OF TEST SETUP



Note: This is a reprehensive setup diagram for Table-top EUT.
For Floor-standing EUT, the table will be removed with all others setup condition remain the same.

3.3 CONDUCTED EMISSION LIMIT

☒FCC 15.207

Frequency	Maximum RF Line Voltage dB(μV)	
MHz	QUASI-PEAK	AVERAGE
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5.0	56	46
5.0 to 30	60	50

Remarks : In the Above Table, the tighter limit applies at the band edges.

3.4 OPERATING CONDITION OF EUT

Same as section 2.7.

3.5 EUT CONFIGURATION ON MEASUREMENT

The equipments that are listed 3.1 are installed on Conducted Power Line Test to meet the Commission requirement and operating in a manner, which tends to maximize its emission characteristics in a normal application.

The device under test, installed in a representative system as described in section 3.2, was placed on a non-conductive table whose total height equal to 80cm. Powered from one L.I.S.N. which signal output to receiver, and the other peripherals was powered from another L.I.S.N. which signal output was terminated by 50Ω.

3.6 CONDUCTED EMISSION DATA

The measurement range of conducted emission, which is from **0.15 MHz to 30 MHz**, was investigated. All readings are quasi-peak and average values with a resolution Bandwidth of 9 KHz. The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range for all the test modes. Then the worst modes were reported the following data pages.

3.7 CONDUCTED EMISSIONS MEASUREMENT RESULTS

Date of Test	July 04, 2006	**Temperature**	25 ℃
EUT	Bluetooth Module	**Humidity**	50 %
Test Mode	TX Mode (Hopping)		

Line

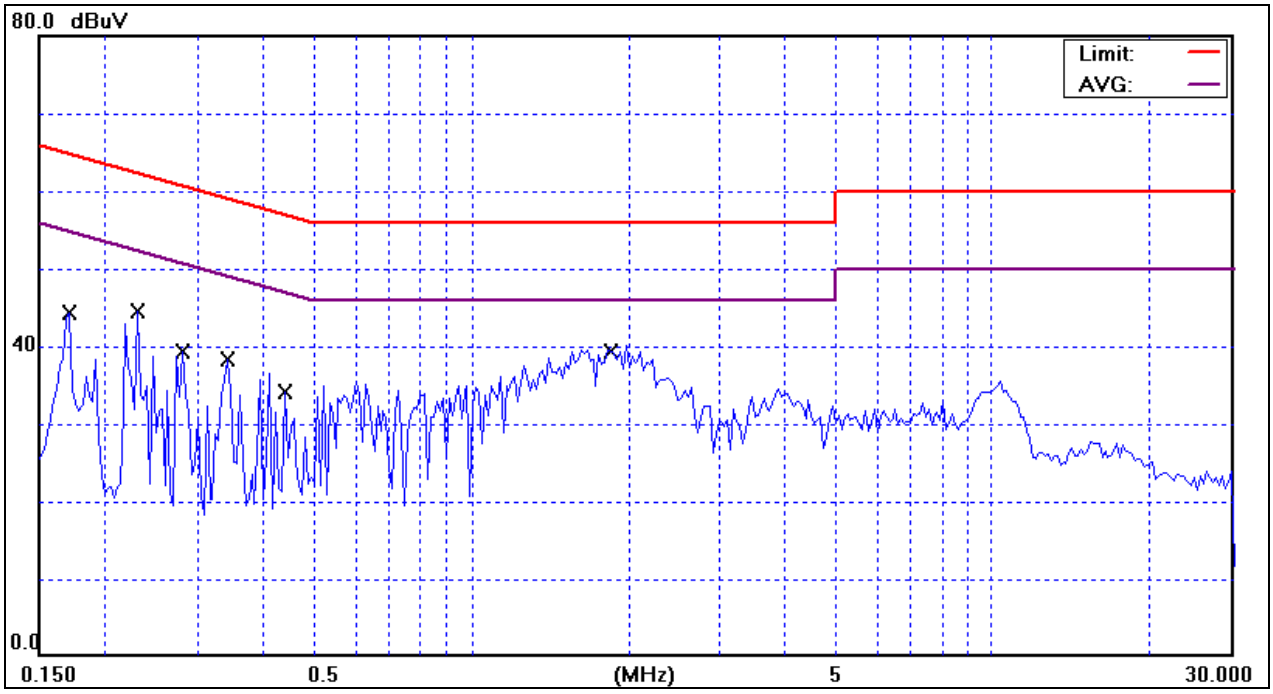
No.	Frequency MHz	Reading Level dBμV	Factor dB	Measurement dBμV	Limit dBμV	Over Limit dB	Detector
1	0.1687	34.56	9.92	44.48	65.02	-20.54	QP
2	0.1687	14.12	9.92	24.04	55.02	-30.98	AVG
3	★0.2295	34.36	9.94	44.30	62.47	-18.17	QP
4	0.2295	22.58	9.94	32.52	52.47	-19.95	AVG
5	0.2818	22.46	9.96	32.42	60.76	-28.34	QP
6	0.2818	4.44	9.96	14.40	50.76	-36.36	AVG
7	0.3417	25.98	9.98	35.96	59.16	-23.20	QP
8	0.3417	19.51	9.98	29.49	49.16	-19.67	AVG
9	0.4333	18.62	10.02	28.64	57.19	-28.55	QP
10	0.4333	4.35	10.02	14.37	47.19	-32.82	AVG
11	1.9157	26.40	10.10	36.50	56.00	-19.50	QP
12	1.9157	14.01	10.10	24.11	46.00	-21.89	AVG

Remarks :

1 All readings are Quasi-peak and Average values.

2 " ★ " means that this data is the worse case emission level.

Line



Date of Test	July 04, 2006	**Temperature**	25 ℃
EUT	Bluetooth Module	**Humidity**	50 %
Test Mode	TX Mode (Hopping)		

Neutral

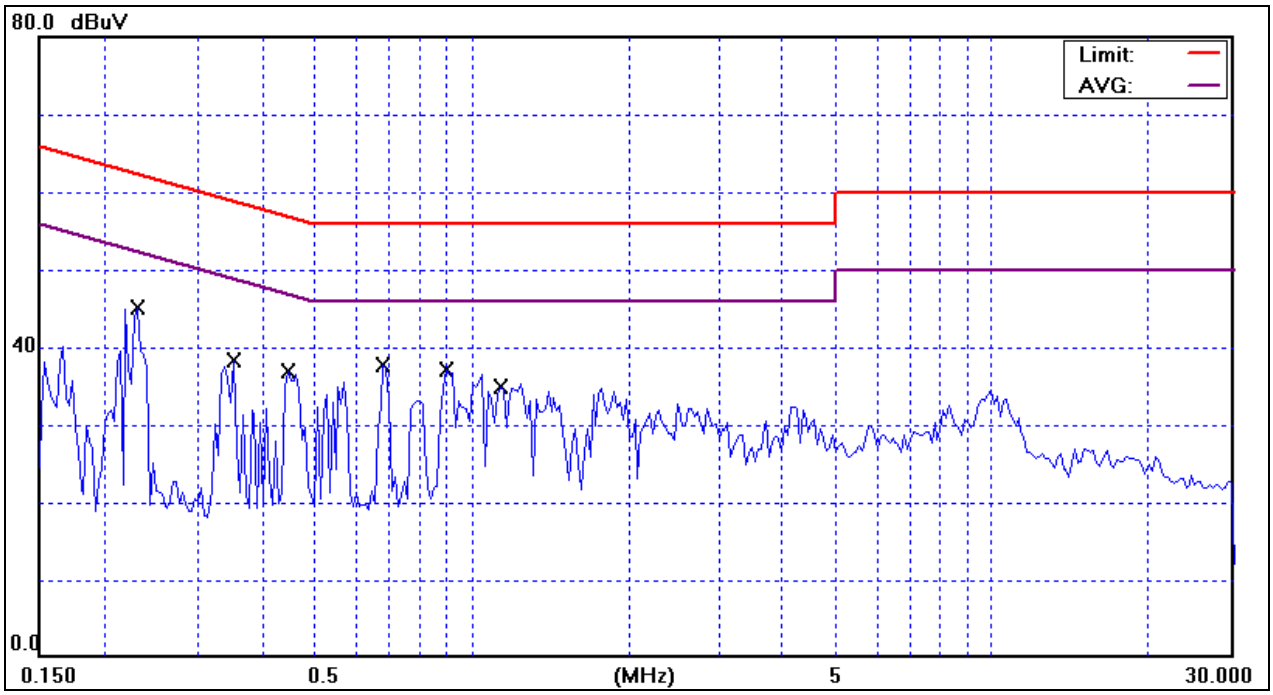
No.	Frequency MHz	Reading Level dBμV	Factor dB	Measurement dBμV	Limit dBμV	Over Limit dB	Detector
1	0.2284	35.26	9.94	45.20	62.51	-17.31	QP
2	★0.2284	25.88	9.94	35.82	52.51	-16.69	AVG
3	0.3417	26.54	9.98	36.52	59.16	-22.64	QP
4	0.3417	20.14	9.98	30.12	49.16	-19.04	AVG
5	0.4527	25.34	10.02	35.36	56.83	-21.47	QP
6	0.4527	18.57	10.02	28.59	46.83	-18.24	AVG
7	0.6844	25.80	10.05	35.85	56.00	-20.15	QP
8	0.6844	17.05	10.05	27.10	46.00	-18.90	AVG
9	0.9234	25.06	10.07	35.13	56.00	-20.87	QP
10	0.9234	14.01	10.07	24.08	46.00	-21.92	AVG
11	1.1401	23.20	10.07	33.27	56.00	-22.73	QP
12	1.1401	12.81	10.07	22.88	46.00	-23.12	AVG

Remarks :

1 All readings are Quasi-peak and Average values.

2 " ★ " means that this data is the worse case emission level.

Neutral



4. RADIATION EMISSION DATA

4.1 TEST EQUIPMENT

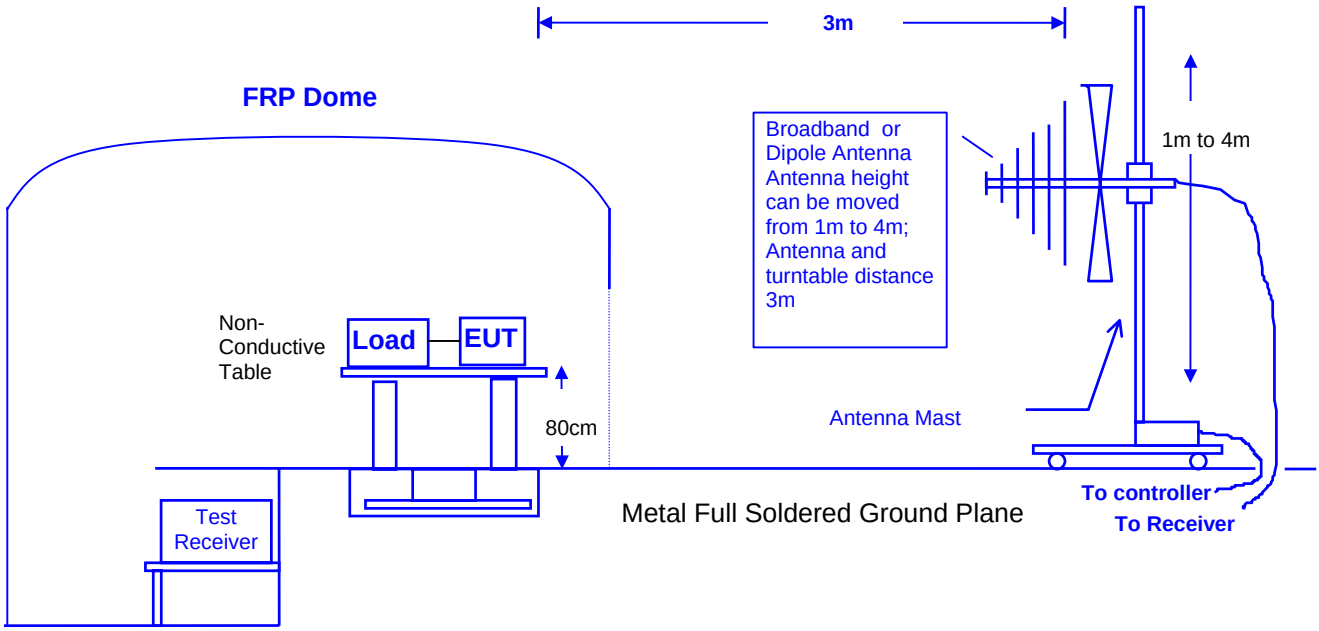
The following test equipments are used during the radiated emission tests:

Radiated test was performed on: ☒Site #1 ☐Site #2 ☐Site #3 ☐Site #4

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Test Receiver	R & S	ESCS30	825022/003	06/08/06
2	Spectrum Analyzer	R & S	FSP40	100061	04/03/06
3	Spectrum Analyzer	HP	E4407B	39240339	07/26/05
4	Power Meter	Rohde & Schwarz	NRVS	100666	04/07/06
5	Peak Power Sensor	Rohde & Schwarz	NRV-Z32	8360191058	04/07/06
6	Pre-Amplifier	HP	8449B	3008A01263	04/06/06
7	BILOG ANTENNA	SCHAFFNER	CBL6112B	2620	11/26/05
8	Horn Antenna	Electro-Metrics	EM-6961	103318	01/26/06
9	Horn Antenna	Schwarzbeck	BBHA 9120	D243	12/21/05
10	RF Cable	GesTek	N/A	GTK-E-A151-01	02/06/06
11	Open Site	GesTek	N/A	A1	11/25/05
12	Test Program Software	GesTek	N/A	GTK-E-S001-01	N/A

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

4.2 OPEN TEST SITE SETUP DIAGRAM



4.3 RADIATED EMISSION LIMIT

☒FCC Class C Limit at 3m

Frequency	Distance	Field Strength	
MHz	Meter	μV/M	dBμV/M
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0

Note：The frequencies above 1000MHz, as measured using instrumentation with a peak detector function was corresponding to 20dB above the maximum permitted average limit.

4.4 EUT CONFIGURATION

The equipment which is listed 4.1 are installed on Radiated Emission Test to meet the Commission requirement and operating in a manner which tends to maximize its emission characteristics in a normal application.

The device under test, installed in a representative system as described in section 4.2, was placed on a non-conductive table whose total height equaled 80 cm. This table can be rotated 360 degree. The measurement antenna was mounted to a non-conductive mast capable of moving the antenna vertically. Antenna height was varied from 1 meter to 4 meters and the system under test was rotated from 0 degree through 360 degrees relative to the antenna position and polarization (Horizontal and Vertical). Also the I/O cable position was investigated to find the maximum emission condition.

4.5 OPERATING CONDITION OF EUT

Same as section 2.7.

4.6 RADIATED EMISSION DATA

The measurement range of radiated emission, which is from **30 MHz to 10th Harminics,** was investigated. All readings below 1GHz are quasi-peak values with a resolution bandwidth of 120 KHz. Above 1GHz are peak and avg. values with a resolution bandwidth of 1MHz. The initial step in collecting radiated emission data is a spectrum analyzer peak scans of the measurement range for all the test modes and then use test receiver for final measurement. Then the worst modes were reported the following data pages.

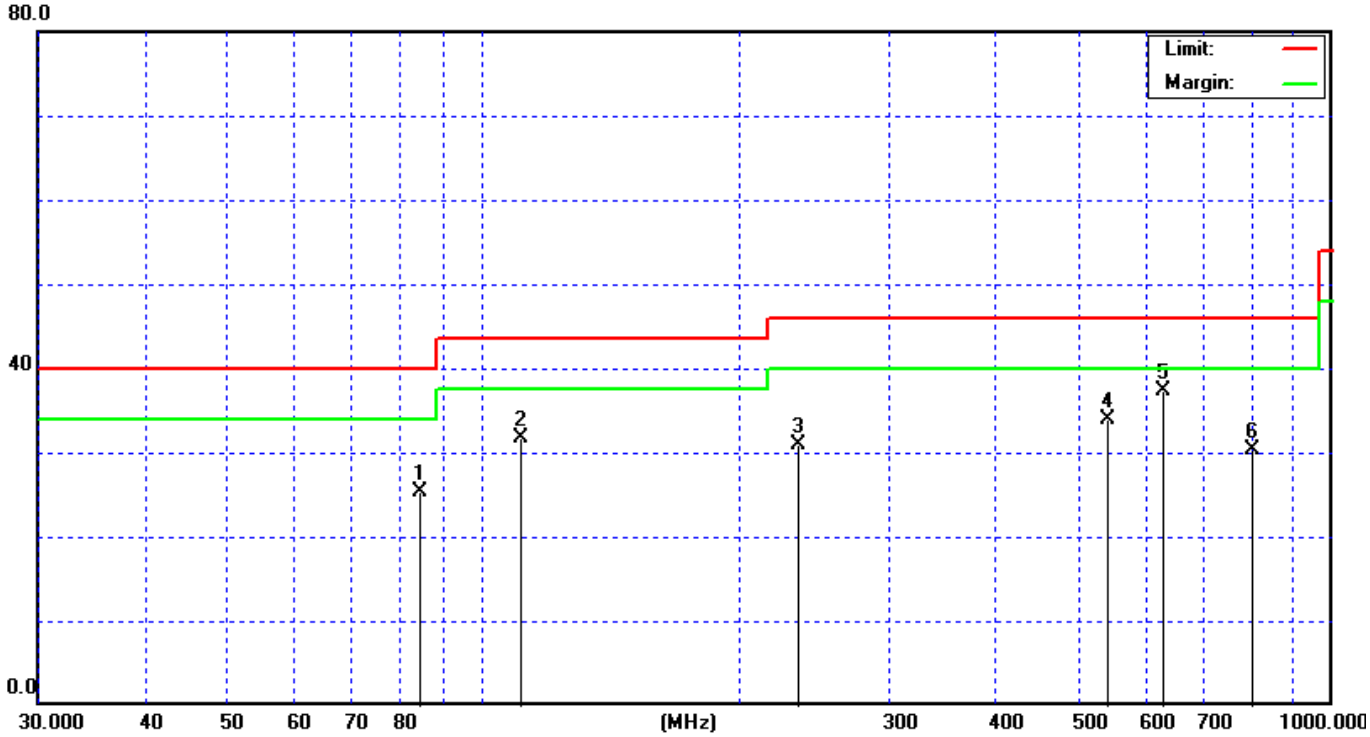
4.7 RADIATED EMISSIONS MEASUREMENT RESULTS

Date of Test	July 04, 2006	**Temperature**	35 deg/C
EUT	Bluetooth Module	**Humidity**	58 %RH
Working Cond.	TX Mode (Hopping)		
Antenna distance	3m at **Horizontal**	**Frequency Range**	30-1000MHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	84.1900	42.80	-17.47	25.33	40.00	-14.67	QP
2	111.3300	44.50	-12.84	31.66	43.50	-11.84	QP
3	235.7700	41.50	-10.66	30.84	46.00	-15.16	QP
4	540.0400	36.10	-2.15	33.95	46.00	-12.05	QP
5	★631.5300	38.00	-0.72	37.28	46.00	-8.72	QP
6	800.9700	27.80	2.57	30.37	46.00	-15.63	QP

Remarks:

1. All Readings below 1GHz are Quasi-Peak.
2. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
3. Over Limit (Margin Value)=Measurement level-Limit value.
4. The "★" means this data is worst-case Measurement level.

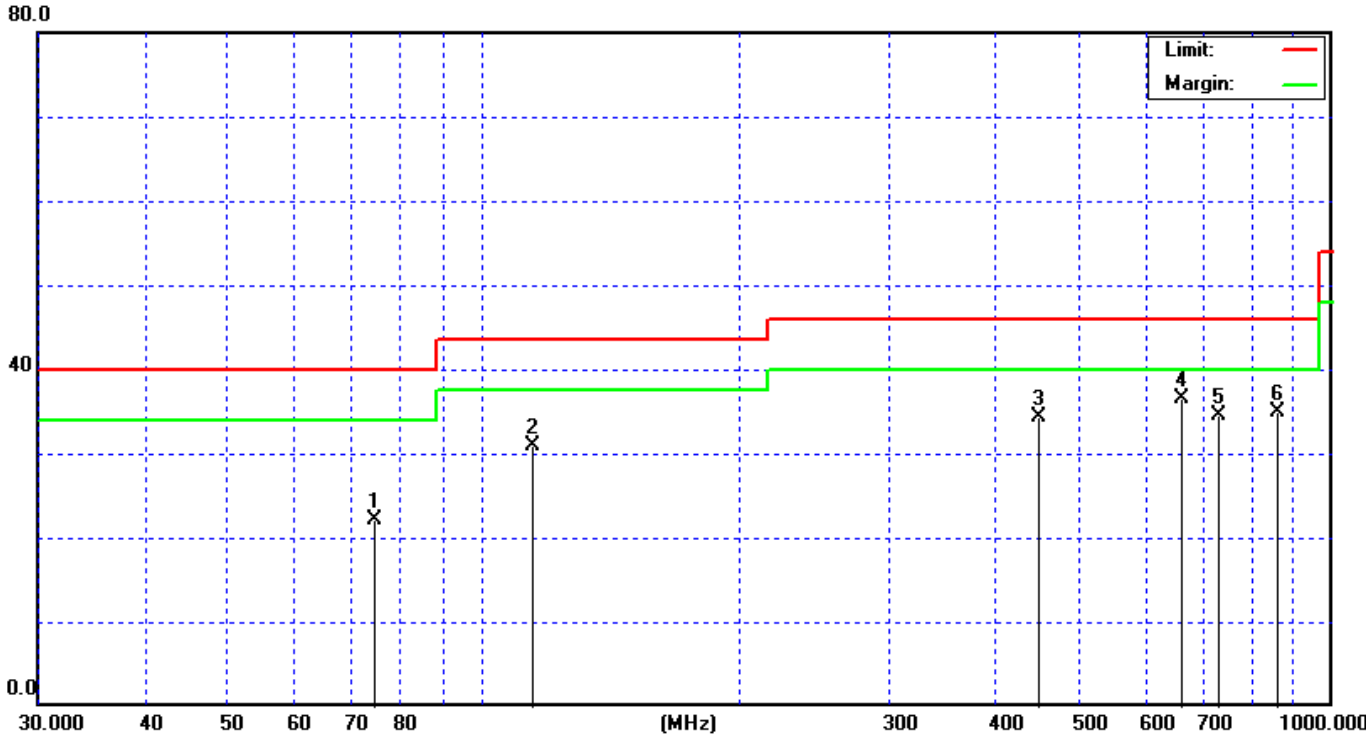


Date of Test	July 04, 2006	**Temperature**	35 deg/C
EUT	Bluetooth Module	**Humidity**	58 %RH
Working Cond.	TX Mode (Hopping)		
Antenna distance	3m at **Vertical**	**Frequency Range**	30-1000MHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	74.4800	40.50	-18.46	22.04	40.00	-17.96	QP
2	114.4163	43.32	-12.48	30.84	43.50	-12.66	QP
3	450.3200	38.00	-3.71	34.29	46.00	-11.71	QP
4	★665.2400	36.80	-0.25	36.55	46.00	-9.45	QP
5	733.4700	33.54	1.02	34.56	46.00	-11.44	QP
6	860.2100	31.00	3.99	34.99	46.00	-11.01	QP

Remarks:

1. All Readings below 1GHz are Quasi-Peak.
2. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
3. Over Limit (Margin Value)=Measurement level-Limit value.
4. The "★" means this data is worst-case Measurement level.



Date of Test	June 30, 2006	**Temperature**	25.6 deg/C
EUT	Bluetooth Module	**Humidity**	63 %RH
Working Cond.	TX Mode (2402MHz)		
Antenna distance	3m at **Horizontal**	**Frequency Range**	Above 1GHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	4803.9300	44.76	1.46	46.22	74.00	-27.78	peak
2	★7206.0500	41.56	9.04	<50.60	74.00	-23.40	peak
3	9608.0500	37.89	6.55	<44.44	74.00	-29.56	peak

Remark

1. All Readings above 1GHz are peak or average detector.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ, Span=20MHz.
4. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Over Limit (Margin Value)=Measurement level-Limit value.
7. The "★" means this data is worst-case Measurement level.
8. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

Date of Test	June 30, 2006	**Temperature**	25.6 deg/C
EUT	Bluetooth Module	**Humidity**	63 %RH
Working Cond.	TX Mode (2402MHz)		
Antenna distance	3m at **Vertical**	**Frequency Range**	Above 1GHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	4803.4800	44.03	1.45	45.48	74.00	-28.52	peak
2	★7206.0800	41.45	8.73	<50.18	74.00	-23.82	peak
3	9608.0800	38.62	10.18	<48.80	74.00	-25.20	peak

Remark

1. All Readings above 1GHz are peak or average detector.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ, Span=20MHz.
4. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Over Limit (Margin Value)=Measurement level-Limit value.
7. The "★" means this data is worst-case Measurement level.
8. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

Date of Test	July 05, 2006	**Temperature**	25.6 deg/C
EUT	Bluetooth Module	**Humidity**	63 %RH
Working Cond.	TX Mode (2441MHz)		
Antenna distance	3m at **Horizontal**	**Frequency Range**	Above 1GHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	4882.4500	44.24	1.42	45.66	74.00	-28.34	peak
2	★7322.3000	42.84	9.25	<52.09	74.00	-21.91	peak
3	9763.3000	43.17	6.93	<50.10	74.00	-23.90	peak

Remark

1. All Readings above 1GHz are peak or average detector.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ, Span=20MHz.
4. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Over Limit (Margin Value)=Measurement level-Limit value.
7. The "★" means this data is worst-case Measurement level.
8. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

Date of Test	July 05, 2006	**Temperature**	25.6 deg/C
EUT	Bluetooth Module	**Humidity**	63 %RH
Working Cond.	TX Mode (2441MHz)		
Antenna distance	3m at **Vertical**	**Frequency Range**	Above 1GHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	4881.6000	44.22	2.06	46.28	74.00	-27.72	peak
2	7322.6000	42.70	8.56	< 51.26	74.00	-22.74	peak
3	★9763.6000	43.41	9.79	< 53.20	74.00	-20.80	peak

Remark

1. All Readings above 1GHz are peak or average detector.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ, Span=20MHz.
4. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Over Limit (Margin Value)=Measurement level-Limit value.
7. The "★" means this data is worst-case Measurement level.
8. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

Date of Test	June 30, 2006	**Temperature**	25.6 deg/C
EUT	Bluetooth Module	**Humidity**	63 %RH
Working Cond.	TX Mode (2480MHz)		
Antenna distance	3m at **Horizontal**	**Frequency Range**	Above 1GHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	4960.0800	41.47	1.34	42.81	74.00	-31.19	peak
2	★7440.0800	41.33	8.78	<50.11	74.00	-23.89	peak
3	9920.0800	42.46	4.61	<47.07	74.00	-26.93	peak

Remark

1. All Readings above 1GHz are peak or average detector.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ, Span=20MHz.
4. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Over Limit (Margin Value)=Measurement level-Limit value.
7. The "★" means this data is worst-case Measurement level.
8. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

Date of Test	June 30, 2006	**Temperature**	25.6 deg/C
EUT	Bluetooth Module	**Humidity**	63 %RH
Working Cond.	TX Mode (2480MHz)		
Antenna distance	3m at **Vertical**	**Frequency Range**	Above 1GHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	4960.0800	41.62	2.64	44.26	74.00	-29.74	peak
2	7440.0800	40.89	8.36	< 49.25	74.00	-24.75	peak
3	★9920.0800	44.01	9.78	< 53.79	74.00	-20.21	peak

Remark

1. All Readings above 1GHz are peak or average detector.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ, Span=20MHz.
4. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Over Limit (Margin Value)=Measurement level-Limit value.
7. The "★" means this data is worst-case Measurement level.
8. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

5. PEAK POWER OUTPUT

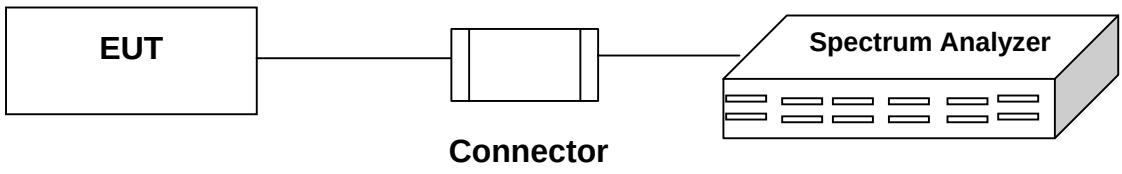
5.1 TEST EQUIPMENT

The following test equipments are used during the Conduct tests:

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde & Schwarz	FSP40	100061	04/03/06
2	Spectrum Analyzer	HP	E4407B	39240339	07/26/05

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

5.2 BLOCK DIAGRAM OF TEST SETUP



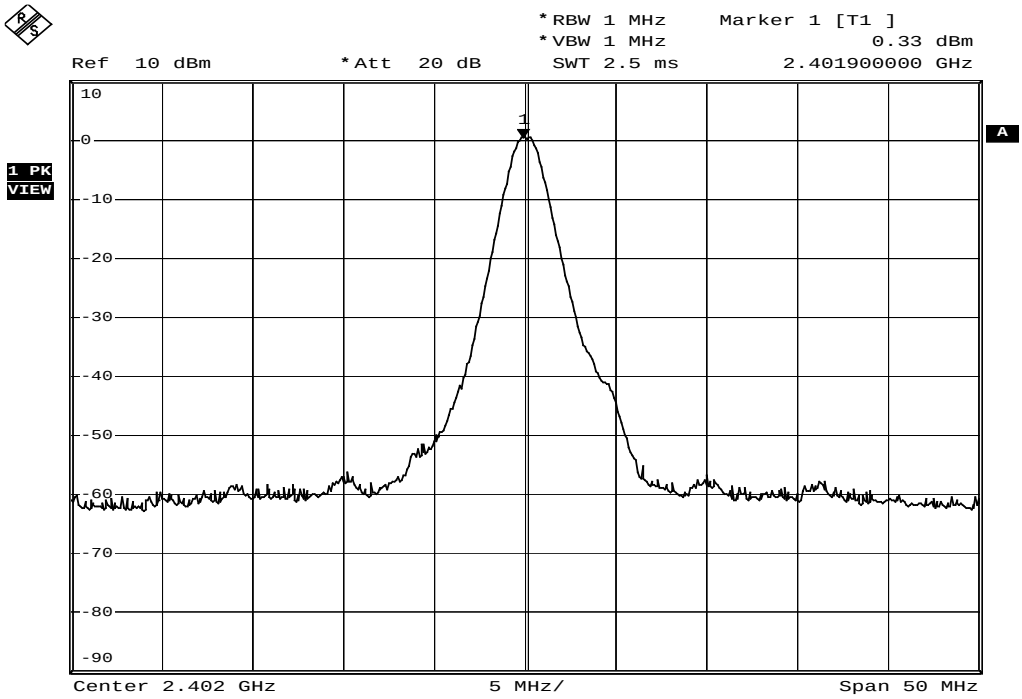
5.3 PEAK POWER OUTPUT LIMIT

The maximum peak power shall be less 1 Watt.

5.4 TEST RESULT

Date of Test	June 30, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	52 %RH
Test Mode	TX Mode	**Data Rate**	DH5

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
0	2402	0.33	1W(30dBm)	Pass
39	2441	0.67	1W(30dBm)	Pass
78	2480	1.06	1W(30dBm)	Pass



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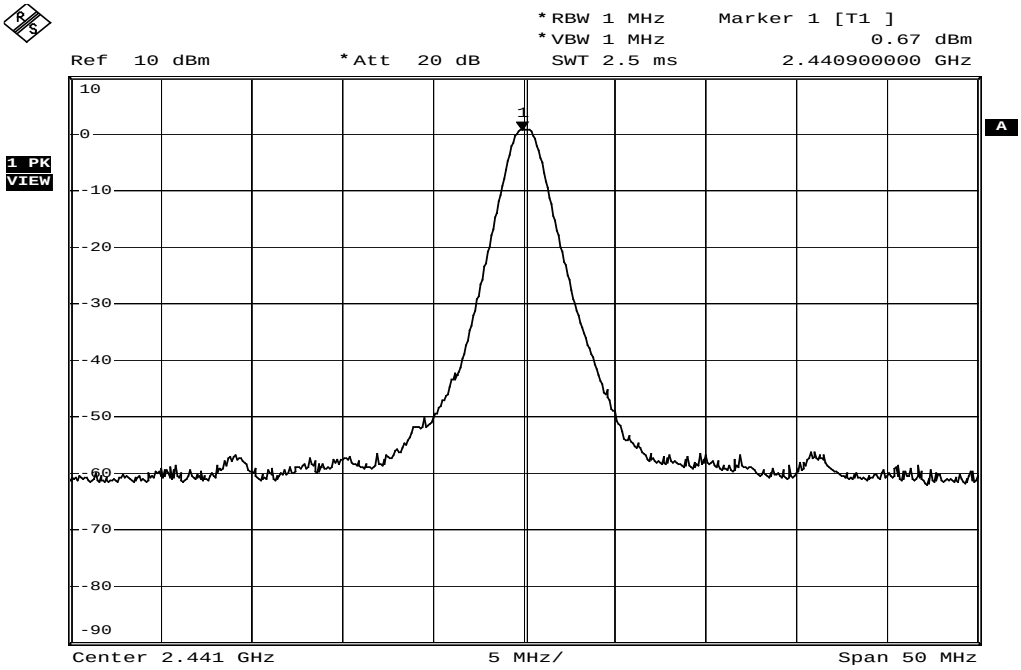

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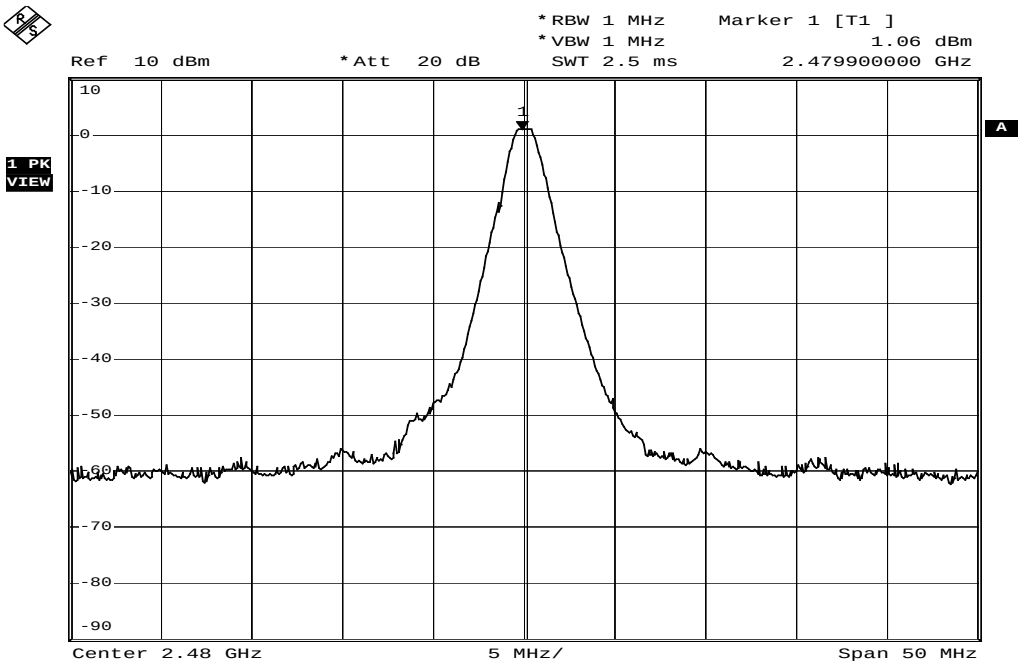

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6. BAND EDGE

6.1 TEST EQUIPMENT

The following test equipments are used during the radiated emission tests:

Radiated test was performed on: ☒Site #1 ☐Site #2 ☐Site #3 ☐Site #4

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Test Receiver	Rohde & Schwarz	ESVS30	829007/014	01/19/06
2	Spectrum Analyzer	Rohde & Schwarz	FSP40	100061	04/03/06
3	Spectrum Analyzer	HP	E4407B	39240339	07/26/05
4	Power Meter	Rohde & Schwarz	NRVS	100666	04/07/06
5	Peak Power Sensor	Rohde & Schwarz	NRV-Z32	8360191058	04/07/06
6	Pre-Amplifier	HP	8449B	3008A01263	04/06/06
7	BILOG ANTENNA	SCHAFFNER	CBL6112B	2620	11/26/05
8	Horn Antenna	Electro-Metrics	EM-6961	103318	01/26/06
9	Horn Antenna	Schwarzbeck	BBHA 9120	D243	12/21/05
10	RF Cable	GesTek	N/A	GTK-E-A151-01	02/26/06
11	Open Site	GesTek	N/A	A1	11/25/05

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

6.2 BLOCK DIAGRAM OF TEST SETUP

RF Radiated Measurement:

Refer to Section 4.2

RF Couductive Measurement:

Refer to Section 5.2

6.3 BAND EDGE LIMIT

In any 100KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209 (a) (see Section 15.205(c)).

6.4 EUT CONFIGURATION

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.
The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2000 on radiated measurement.
The bandwidth below 1GHz setting on the field strength meter is 120KHz, above 1GHz are 1MHz.

6.5 OPERATING CONDITION OF EUT

Same as section 2.7.

6.6 TEST RELULT

Date of Test	July 03, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	51 %RH
Working Cond.	TX Mode		
Antenna distance	3m at **Horizontal**	**Test Band**	Lower

Radiation Emission of Fundamental

Peak

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2401.98	55.99	31.49	87.48

Average

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2402.05	55.13	31.49	86.62

Remark:

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ
4. Emission Level= Reading + Correction Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor

TEST Result

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (56.19)dB delta between carry power and maximum emission in restrict band 2386.4 MHz. The plot for average is appear (65.66)dB delta between carry power and maximum emission in restrict band (2376)MHz.
The above tables are list of fundamental emission test result.
Therefore, peak field strength of 2386.4 MHz is 87.48 dBuV/m – 56.19 dB = 31.29 dBuV/m which is under 74dBuV/m.
Average field strength of 2376 MHz is 86.62 dBuV/m – 65.66 dB = 20.96 dBuV/m which is under 54dBuV/m

Date of Test	July 03, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	51 %RH
Working Cond.	TX Mode		
Antenna distance	3m at **Vertical**	**Test Band**	Lower

Radiation Emission of Fundamental

Peak

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2402	56.78	24.6	81.38

Average

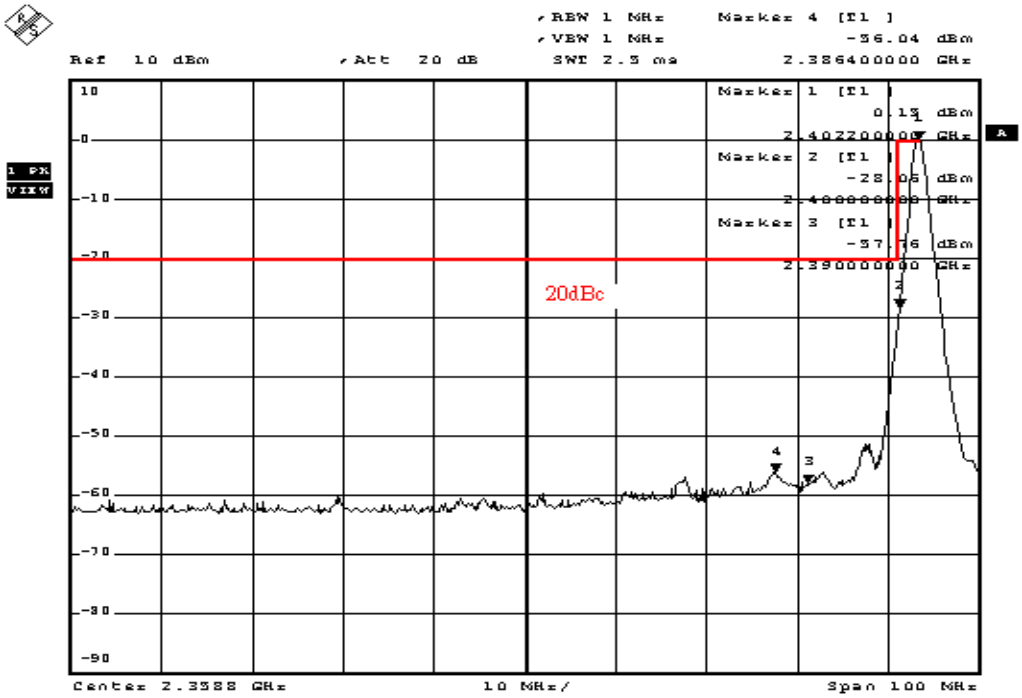
Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2402.5	55.48	24.6	80.08

Remark:

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ
4. Emission Level= Reading + Correction Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor

TEST Result

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (56.19)dB delta between carry power and maximum emission in restrict band 2386.4 MHz. The plot for average is appear (65.66)dB delta between carry power and maximum emission in restrict band (2376)MHz.
The above tables are list of fundamental emission test result.
Therefore, peak field strength of 2386.4 MHz is 81.38 dBuV/m – 56.19 dB = 25.19 dBuV/m which is under 74dBuV/m.
Average field strength of 2376 MHz is 80.08 dBuV/m – 65.66 dB = 14.42 dBuV/m which is under 54dBuV/m



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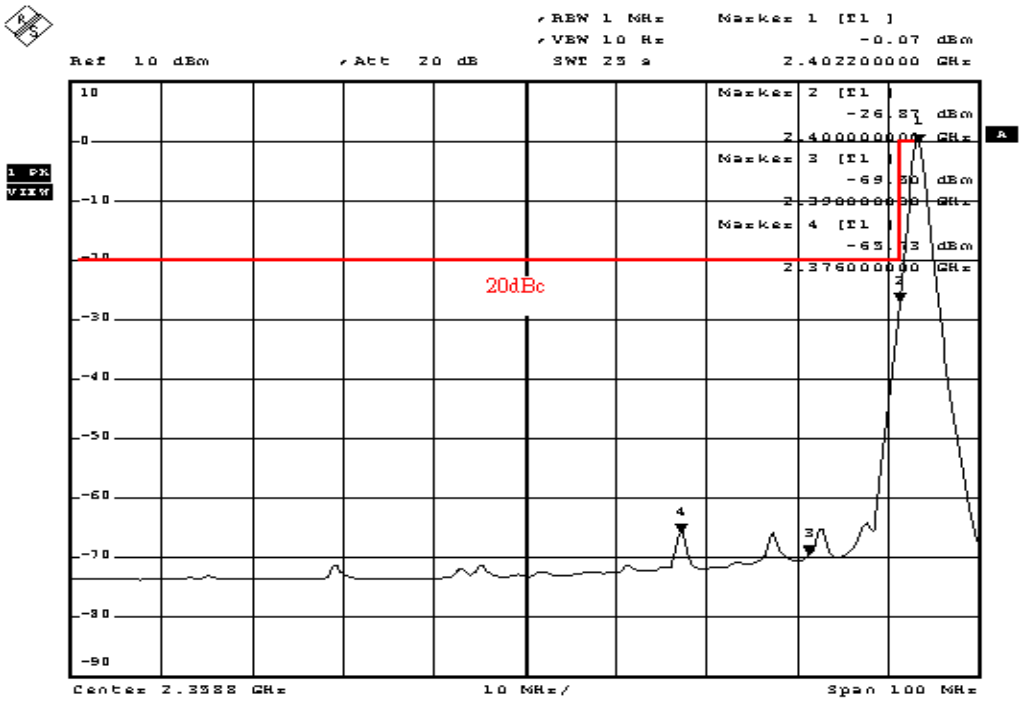


Date: 30.JUN.2006 18:09:53

Date of Test	July 03, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	51 %RH
Working Cond.	TX Mode		
Antenna distance	3m at **Horizontal**	**Test Band**	Higher

Radiation Emission of Fundamental

Peak

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2480.03	55.48	31.32	86.80

Average

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2480.03	55.05	31.32	86.37

Remark:

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ
4. Emission Level= Reading + Correction Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor

TEST Result

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (41.75)dB delta between carry power and maximum emission in restrict band 2483.5 MHz. The plot for average is appear (42.52)dB delta between carry power and maximum emission in restrict band (2483.5)MHz.
The above tables are list of fundamental emission test result.
Therefore, peak field strength of 2483.5 MHz is 86.8 dBuV/m – 41.75 dB = 45.05 dBuV/m which is under 74dBuV/m.
Average field strength of 2483.5 MHz is 86.37 dBuV/m – 42.52 dB = 43.85 dBuV/m which is under 54dBuV/m

Date of Test	July 03, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	51 %RH
Working Cond.	TX Mode		
Antenna distance	3m at **Vertical**	**Test Band**	Higher

Radiation Emission of Fundamental

Peak

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2479.950	58.19	23.33	81.52

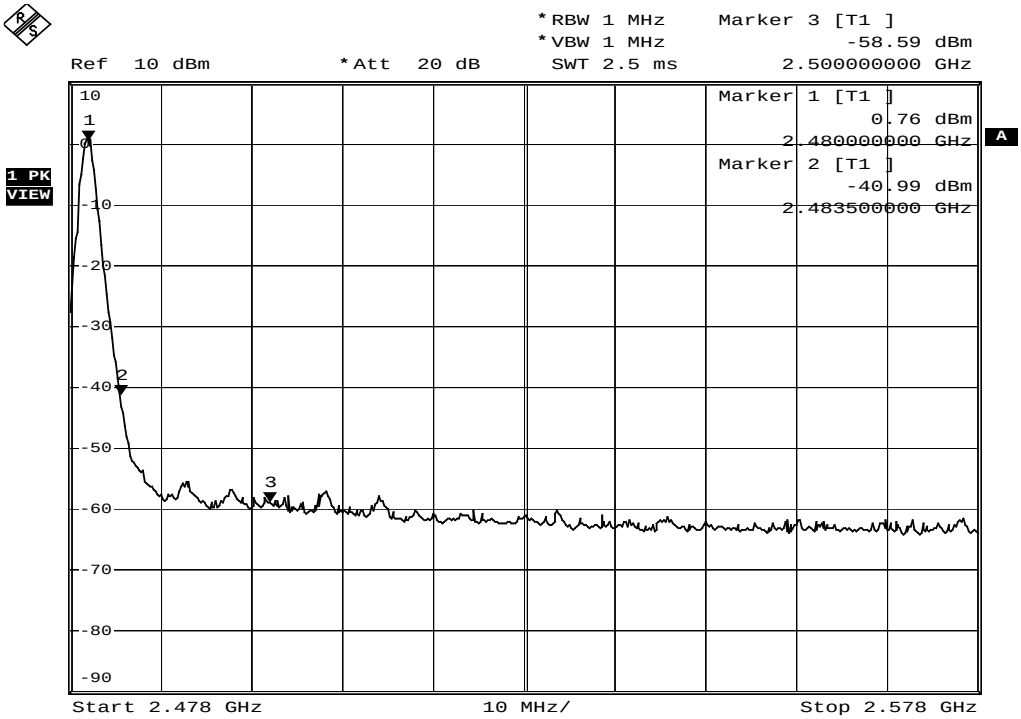
Average

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2480.1	56.87	23.33	80.20

Remark:
1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ.
3. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ
4. Emission Level= Reading + Correction Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor

TEST Result

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (41.75)dB delta between carry power and maximum emission in restrict band 2483.5 MHz. The plot for average is appear (42.52)dB delta between carry power and maximum emission in restrict band (2483.5)MHz.
The above tables are list of fundamental emission test result.
Therefore, peak field strength of 2483.5 MHz is 81.52 dBuV/m – 41.75 dB = 39.97 dBuV/m which is under 74dBuV/m.
Average field strength of 2483.5 MHz is 80.20 dBuV/m – 42.52 dB = 37.68 dBuV/m which is under 54dBuV/m



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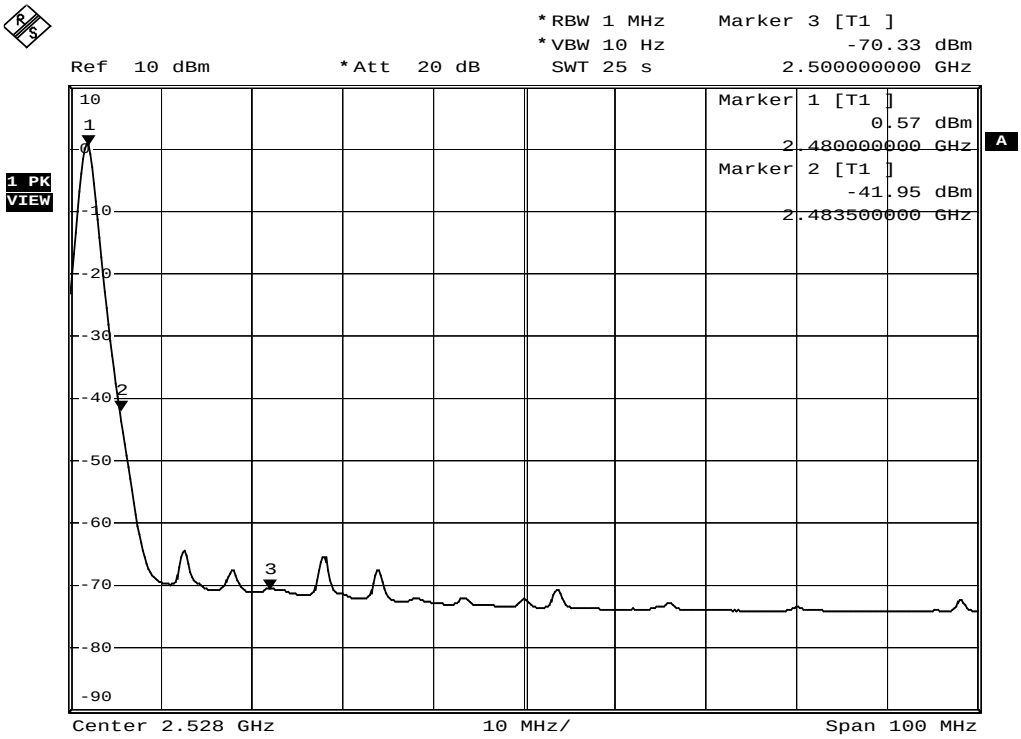

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7. OCCUPIED BANDWIDTH

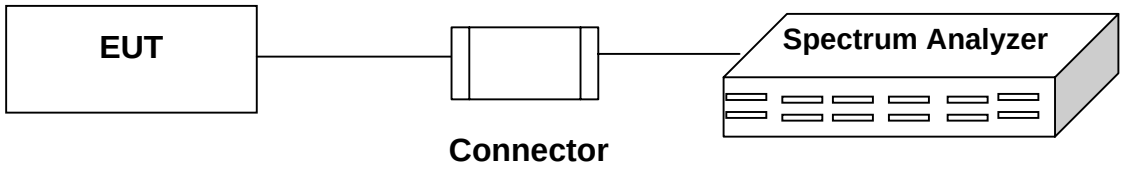
7.1 TEST EQUIPMENT

The following test equipments are used during the radiated emission tests:

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde & Schwarz	FSP40	100061	04/03/06
2	Spectrum Analyzer	HP	E4407B	39240339	07/26/05

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

7.2 BLOCK DIAGRAM OF TEST SETUP



7.3 LIMIT

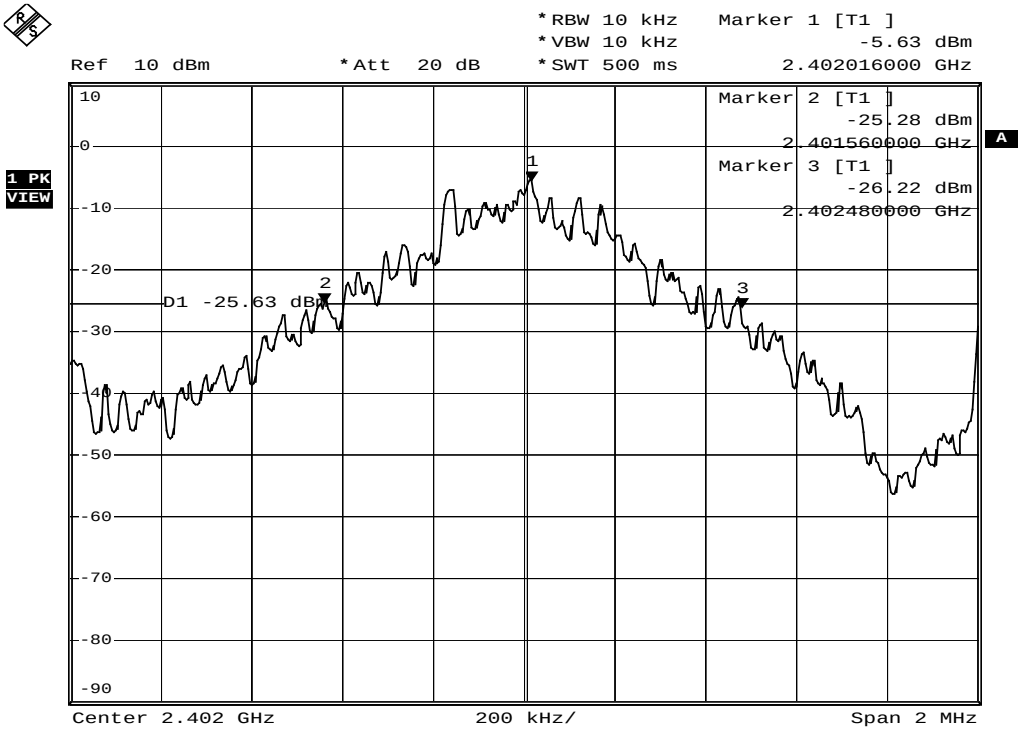
The maximum 20 dB bandwidth shall be muasurement.

7.4 TEST RESULT

Date of Test	June 30, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	52 %RH
Working Cond.	TX Mode		

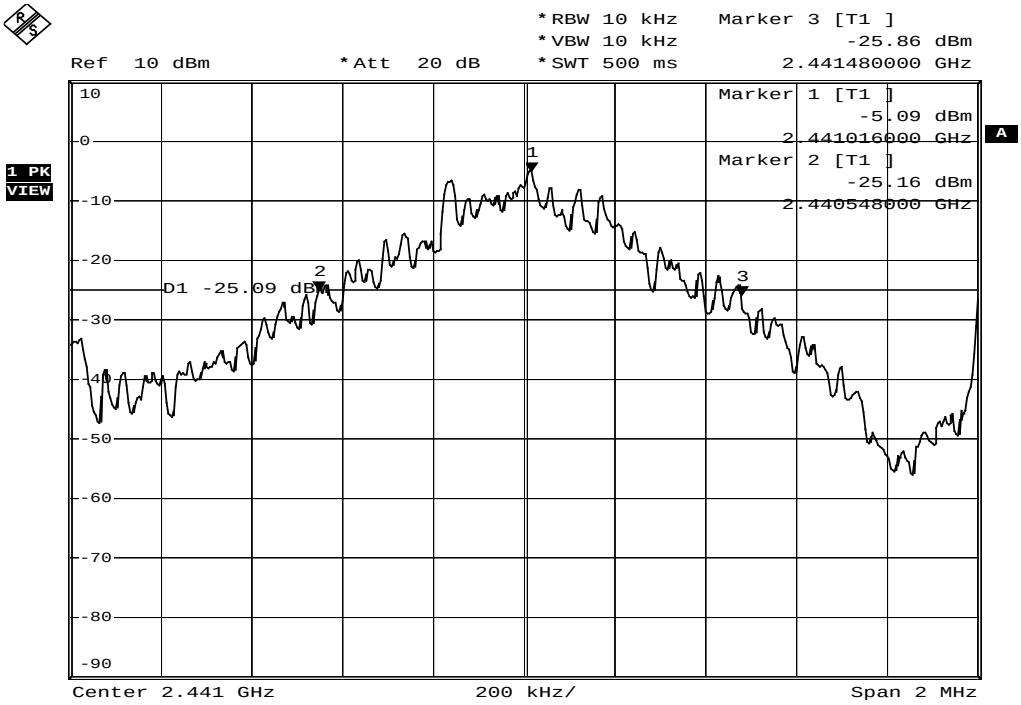
Channel No.	Frequency (MHz)	20dB Bandwidth (MHz)
0	2402	0.92
39	2441	0.932
78	2480	0.928

Figure Channel 0:



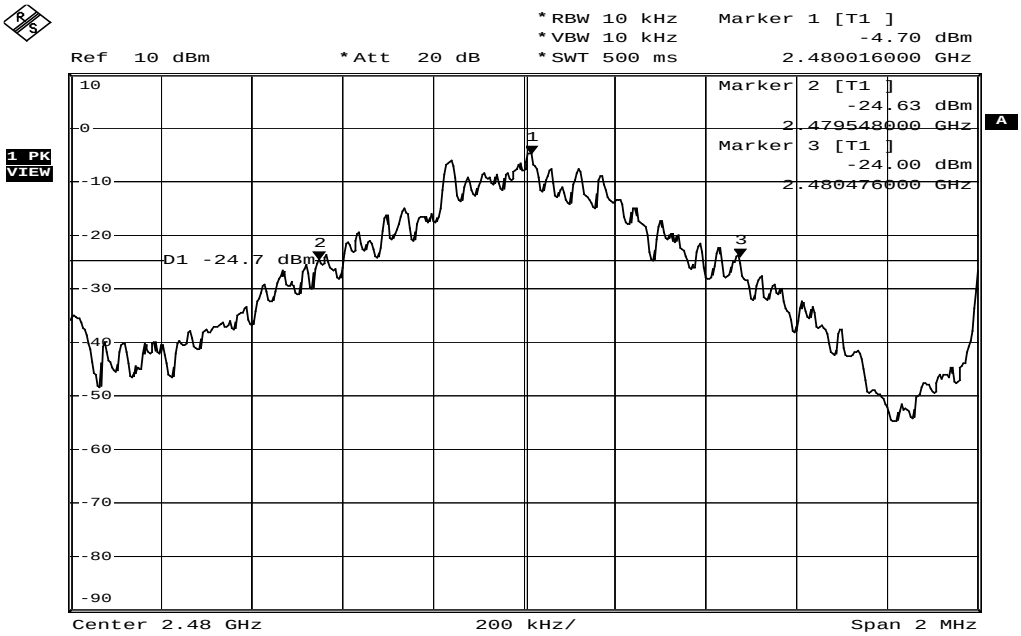
Date: 30.JUN.2006 18:40:09

Figure Channel 39:



Date: 30.JUN.2006 18:37:12

Figure Channel 78:



Date: 30.JUN.2006 18:33:19

8. CHANNEL SEPARATION

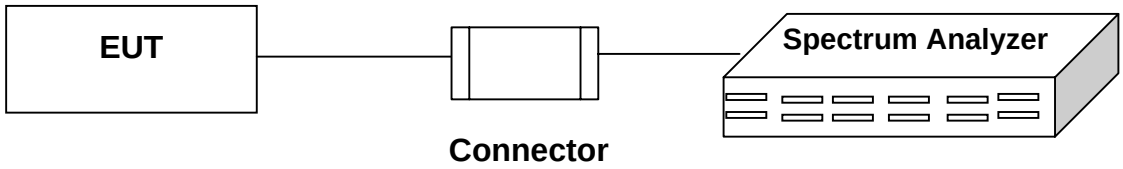
8.1 TEST EQUIPMENT

The following test equipments are used during the radiated emission tests:

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde & Schwarz	FSP40	100061	04/03/06
2	Spectrum Analyzer	HP	E4407B	39240339	07/26/05

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

8.2 BLOCK DIAGRAM OF TEST SETUP



8.3 LIMIT

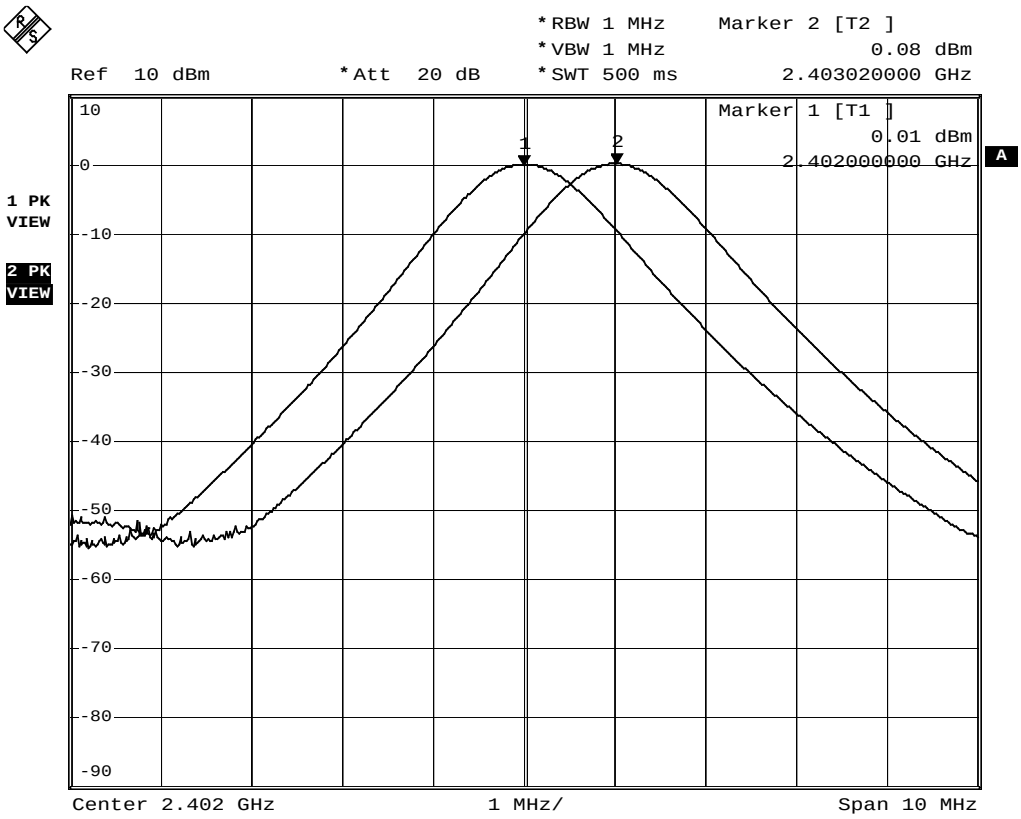
Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is grester.

8.4 TEST RESULT

Date of Test	June 30, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	52 %RH
Working Cond.	TX Mode		

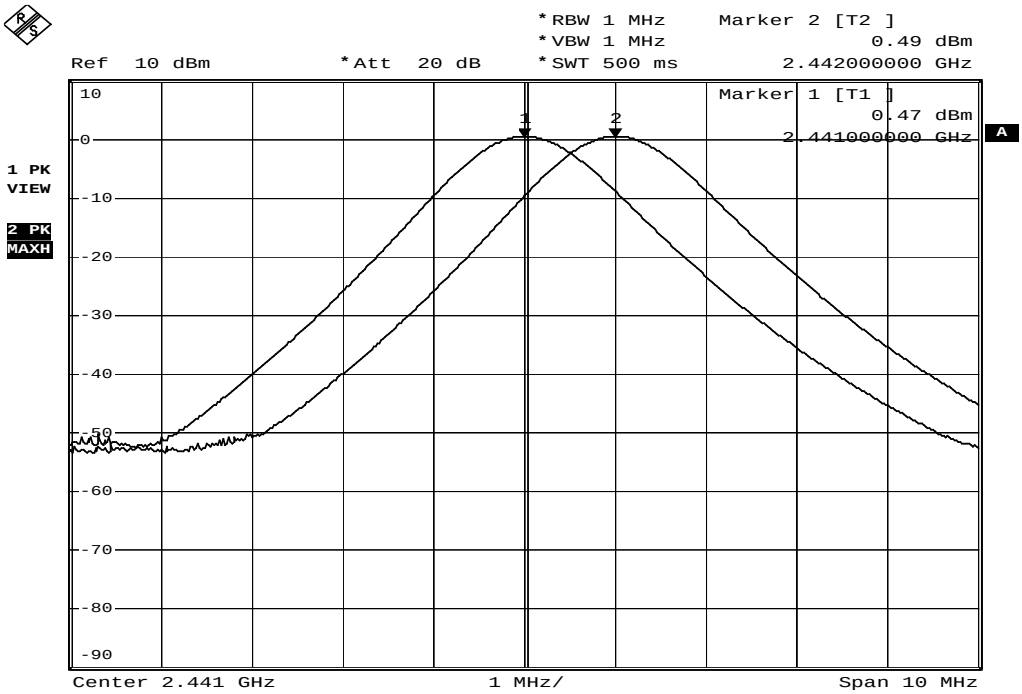
Test Channel No.	Channel Separated (kHz)	Limit (kHz)	Limit of 20dB Bandwidth (kHz)	Result
0	1020	＞25	＞920	Pass
39	1000	＞25	＞932	Pass
78	1000	＞25	＞928	Pass

Figure Channel 0:



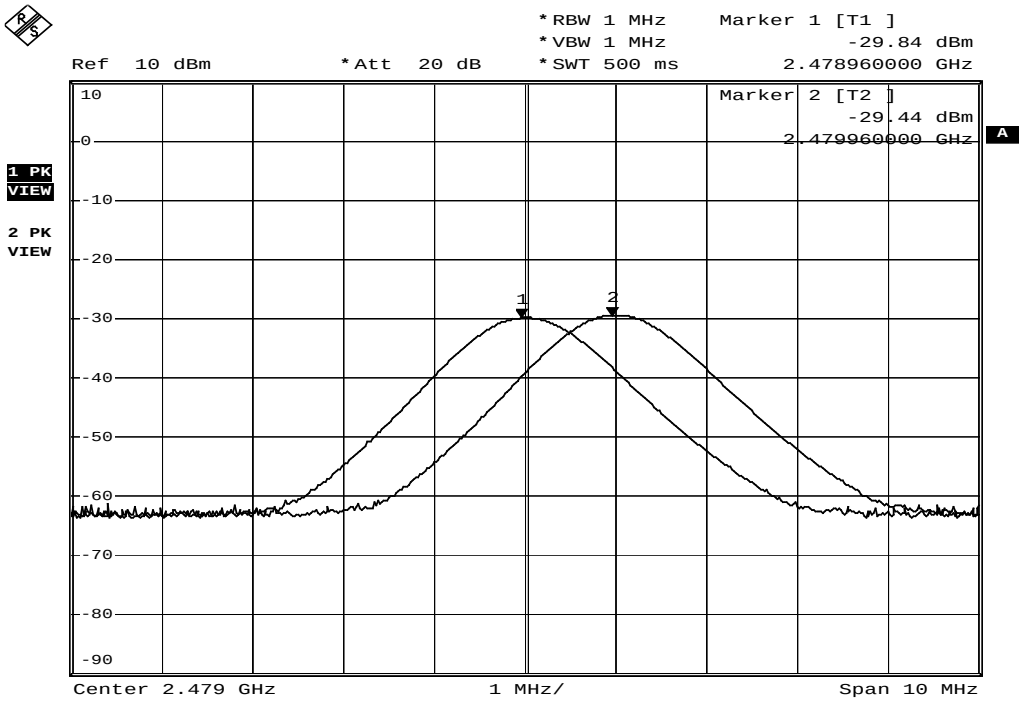
Date: 30.JUN.2006 19:00:54

Figure Channel 39:



Date: 30.JUN.2006 19:08:03

Figure Channel 78:



Date: 4.JUL.2006 17:14:29

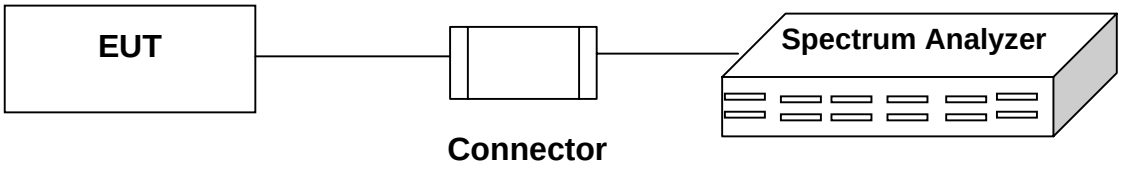
9. DWELL TIME

9.1 TEST EQUIPMENT

The following test equipments are used during the radiated emission tests:

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde & Schwarz	FSP40	100061	04/03/06
2	Spectrum Analyzer	HP	E4407B	39240339	07/26/05

9.2 BLOCK DIAGRAM OF TEST SETUP



9.3 LIMIT

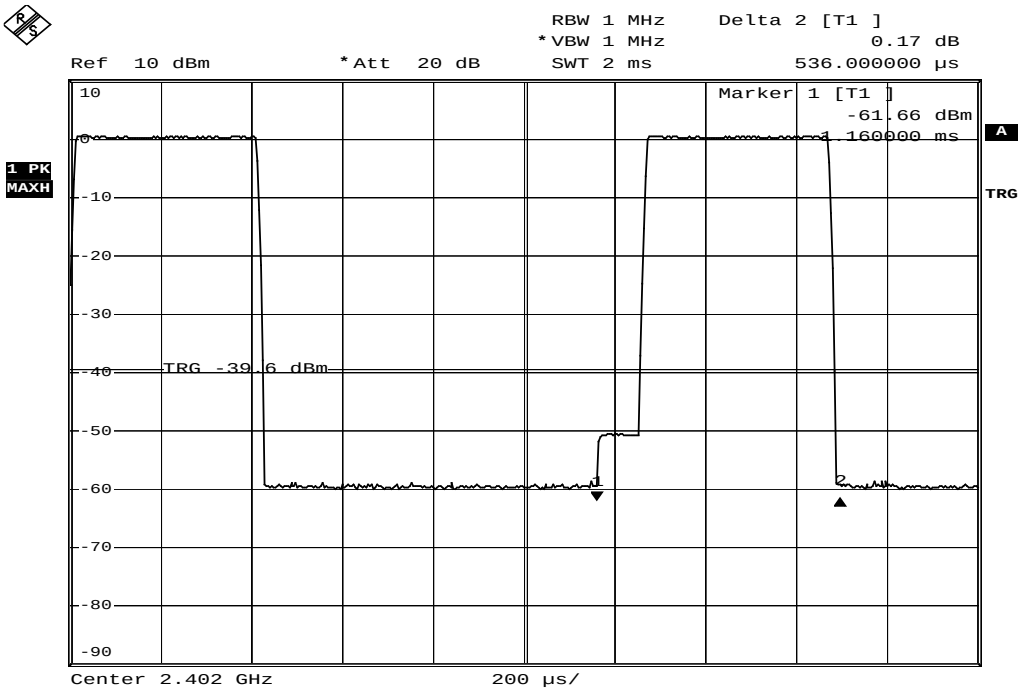
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by number of hopping channels employed.

9.4 TEST RESULT

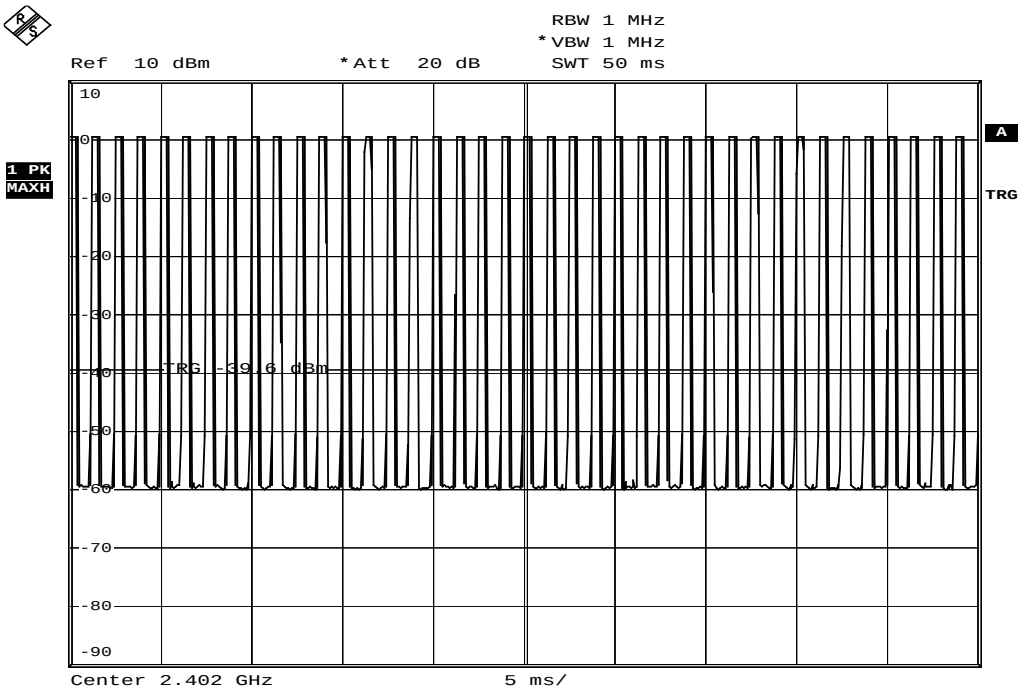
Date of Test	June 30, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	52 %RH
Working Cond.	TX Mode(2402MHz)		

Measurement Level (sec)	Required Limit (sec)	Result
Period ＝ 0.4 (sec) * 79 (number of channel) ＝ 31.6 (sec) Hop rate ＝ 40 / 50 (ms) ＝ 800 / sec Time slot length ＝ 536 (µs) ＝ 0.000536 (sec)	< 0.4	Pass
※ Dwell Time ＝0.000536 * (800 / 79) * 31.6 ＝0.1715 (sec)		

Note: Dwell time＝time slot length * hop rate / number of hopping channels * period



Date: 30.JUN.2006 19:25:59

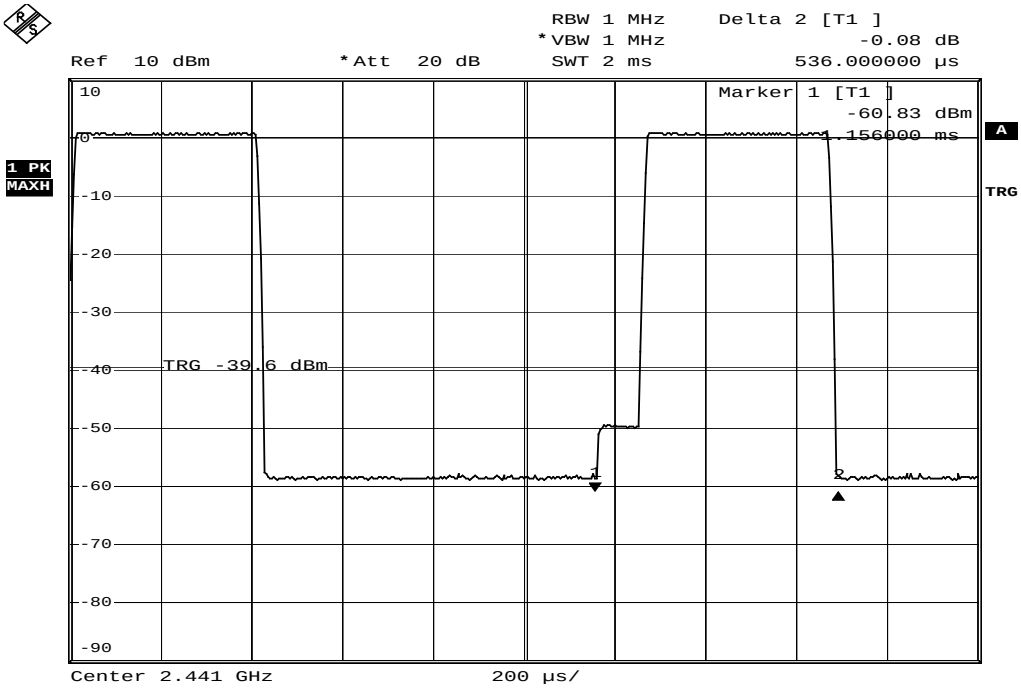


Date: 30.JUN.2006 19:28:48

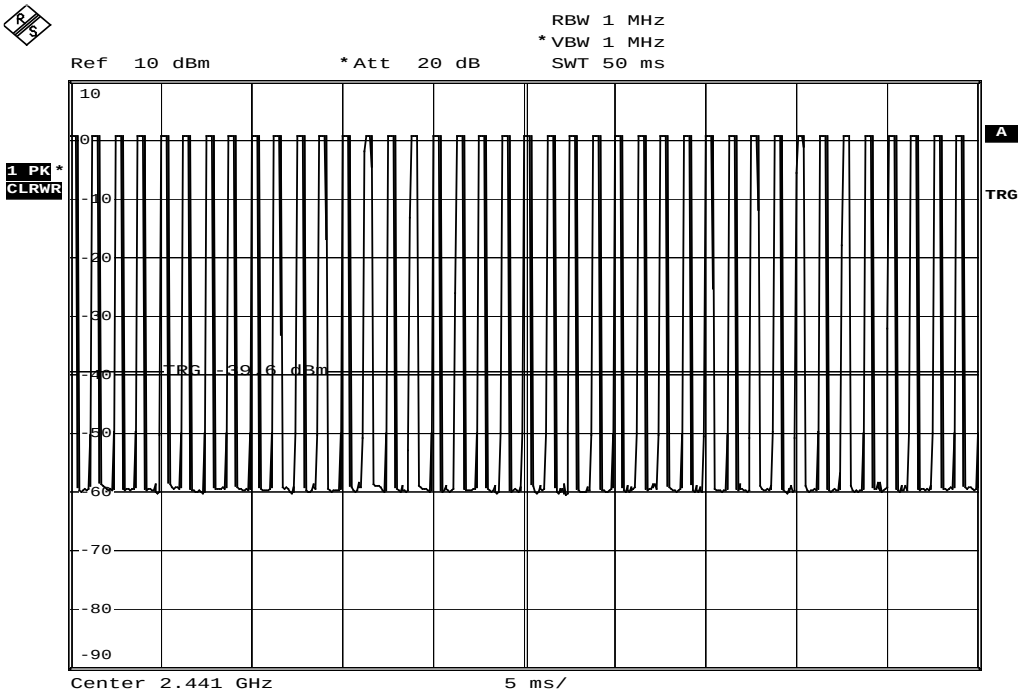
Date of Test	June 30, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	52 %RH
Working Cond.	TX Mode (2441MHz)		

Measurement Level (sec)	Required Limit (sec)	Result
Period ＝ 0.4 (sec) * 79 (number of channel) ＝ 31.6 (sec) Hop rate ＝ 40 / 50 (ms) ＝ 800 / sec Time slot length ＝ 536 (µs) ＝ 0.000536 (sec)	< 0.4	Pass
※ Dwell Time ＝0.000536 * (800 / 79) * 31.6 ＝0.1715 (sec)		

Note: Dwell time＝time slot length * hop rate / number of hopping channels * period



Date: 30.JUN.2006 19:35:05

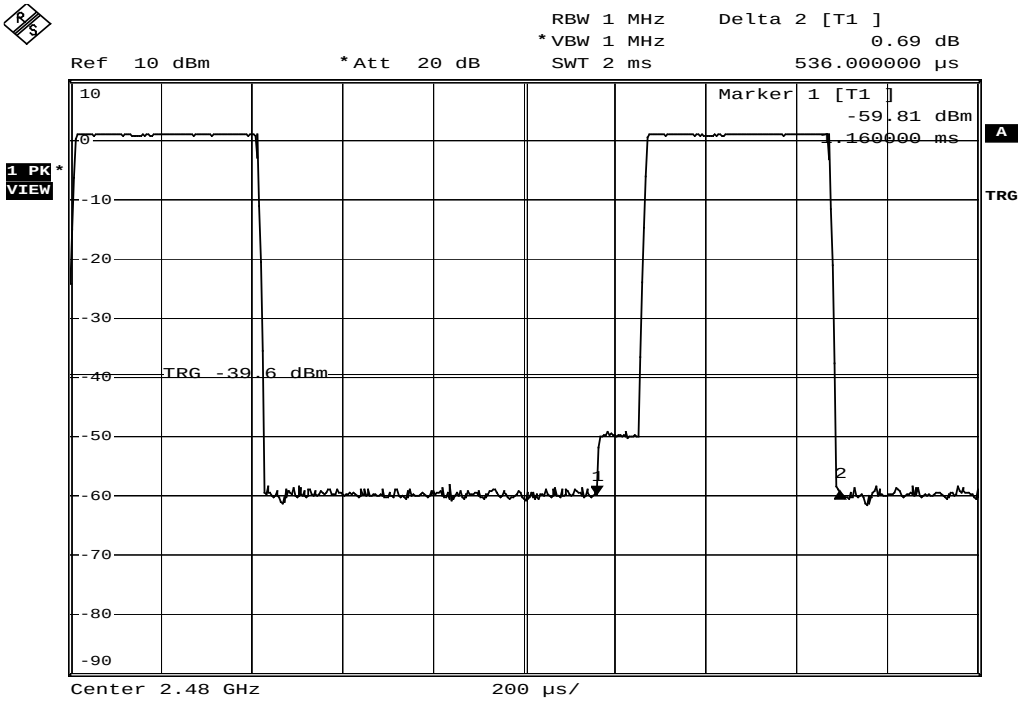


Date: 30.JUN.2006 19:51:57

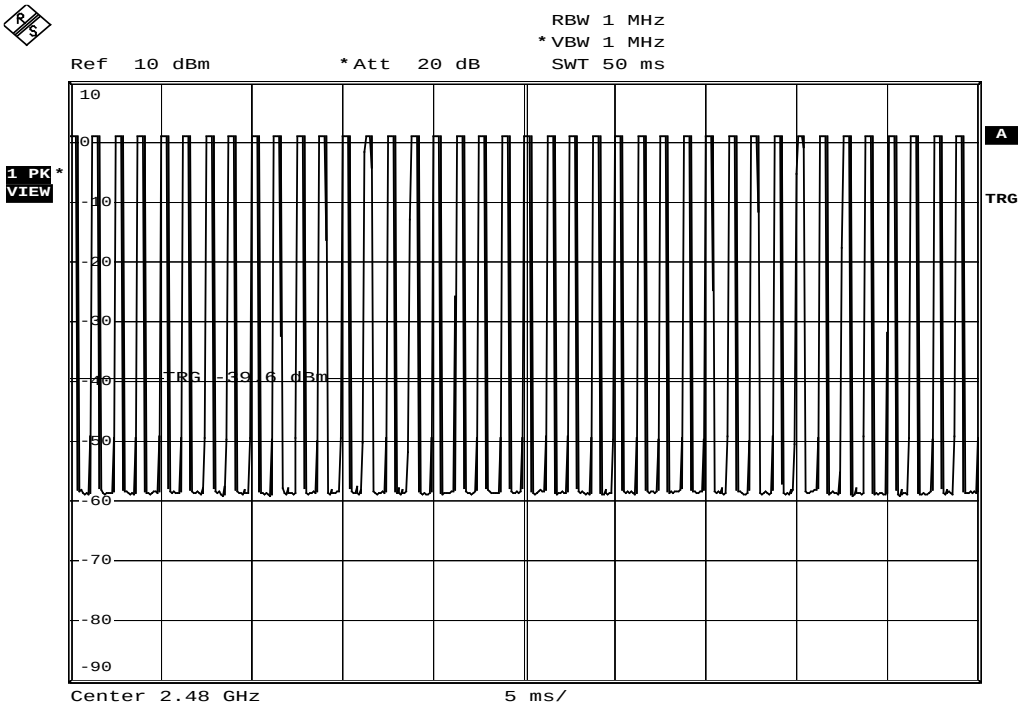
Date of Test	June 30, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	52 %RH
Working Cond.	TX Mode (2480MHz)		

Measurement Level (sec)	Required Limit (sec)	Result
Period ＝ 0.4 (sec) * 79 (number of channel) ＝ 31.6 (sec) Hop rate ＝ 40 / 50 (ms) ＝ 800 / sec Time slot length ＝ 536 (µs) ＝ 0.000536 (sec)	< 0.4	Pass
※ Dwell Time ＝0.000536 * (800 / 79) * 31.6 ＝0.1715 (sec)		

Note: Dwell time＝time slot length * hop rate / number of hopping channels * period



Date: 30.JUN.2006 19:43:30



Date: 30.JUN.2006 19:46:53

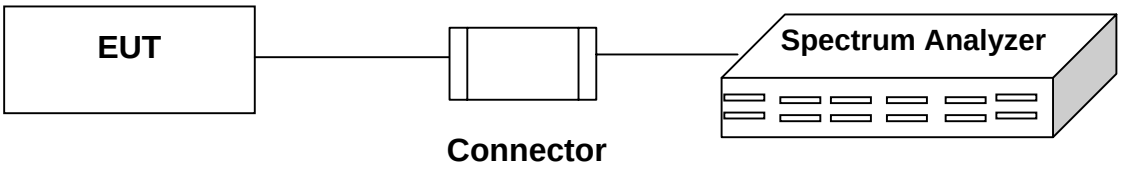
10. HOPPING CHANNEL

10.1 TEST EQUIPMENT

The following test equipments are used during the radiated emission tests:

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde & Schwarz	FSP40	100061	04/03/06
2	Spectrum Analyzer	HP	E4407B	39240339	07/26/05

10.2 BLOCK DIAGRAM OF TEST SETUP



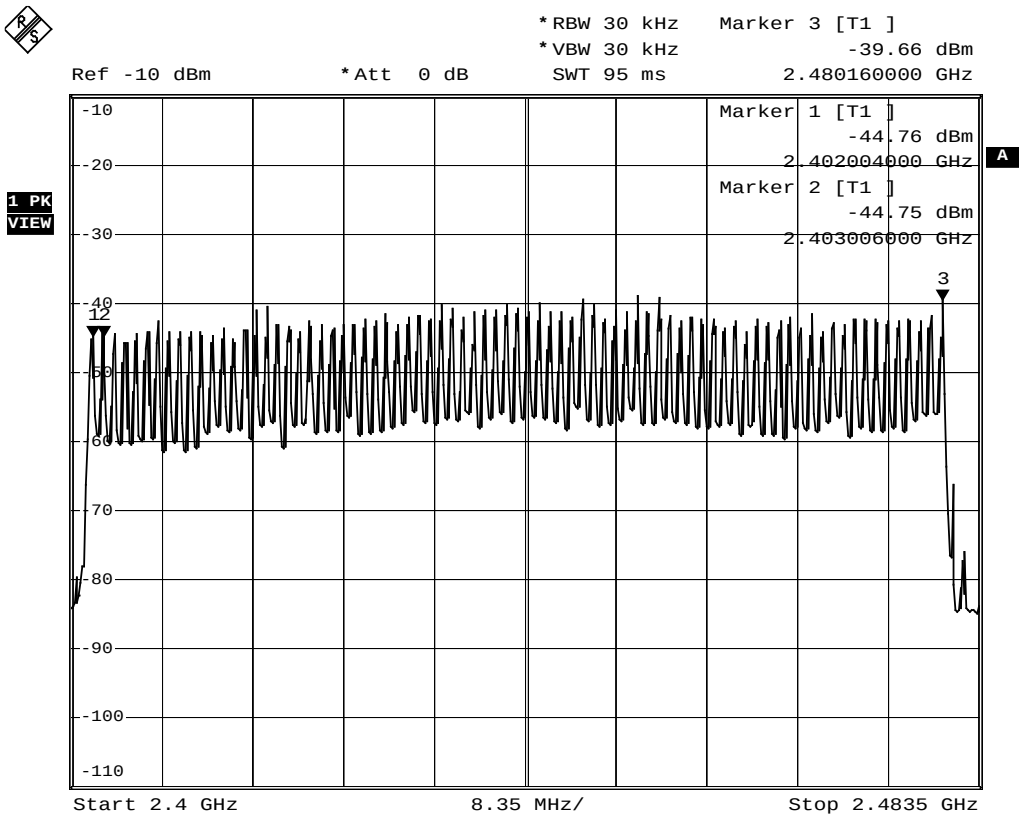
10.3 LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 non-overlapping hopping channels.

10.4 TEST RELULT

Date of Test	July 04, 2006	**Temperature**	26 deg/C
EUT	Bluetooth Module	**Humidity**	52 %RH
Working Cond.	TX Mode (Hopping)		

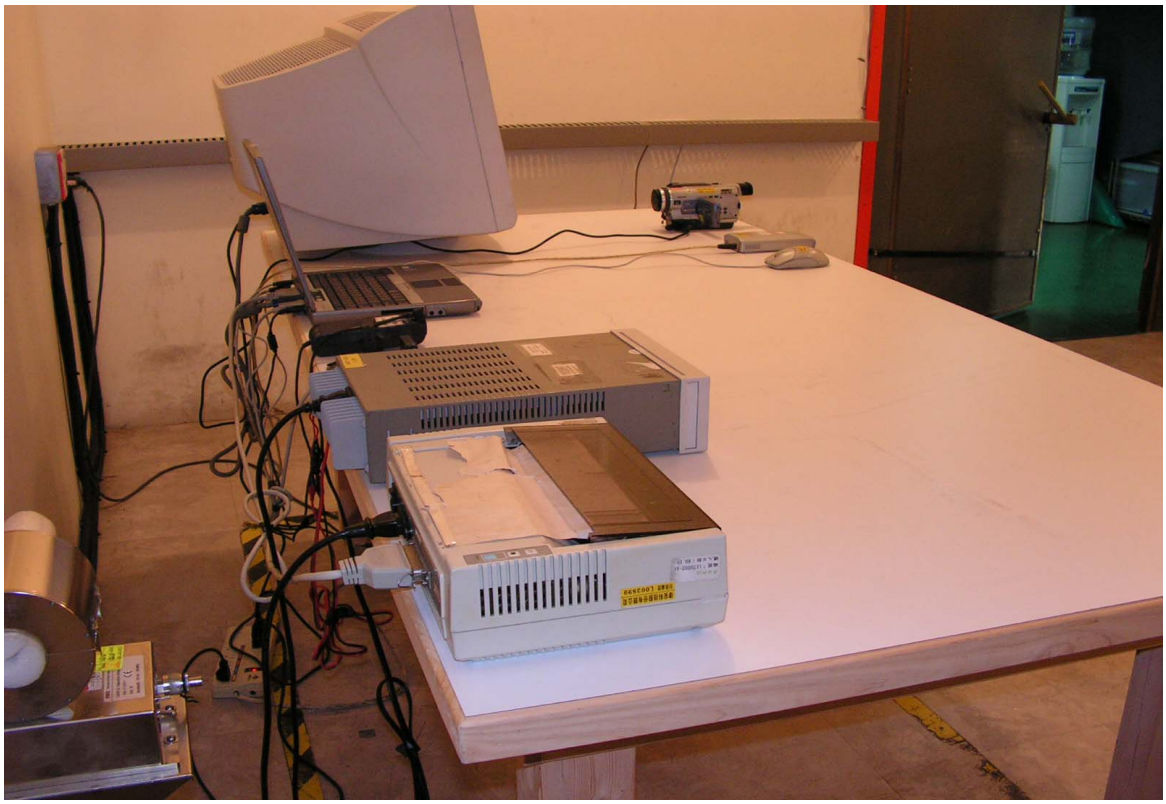
Frequency Range (MHz)	Measurement (Hopping Channel)	Limit (Hopping Channel)	Result
2402 - 2480	79	＞75	Pass



Date: 4.JUL.2006 12:23:35

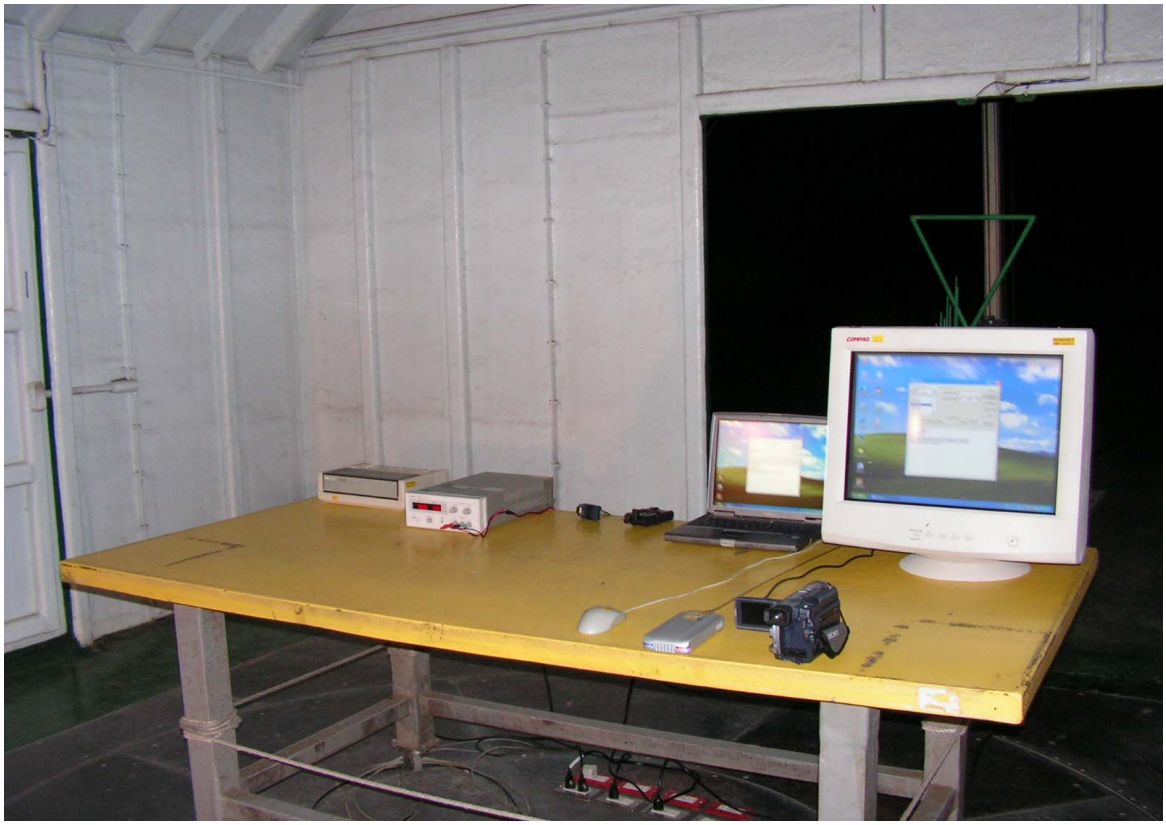
11. PHOTOGRAPHS FOR TEST

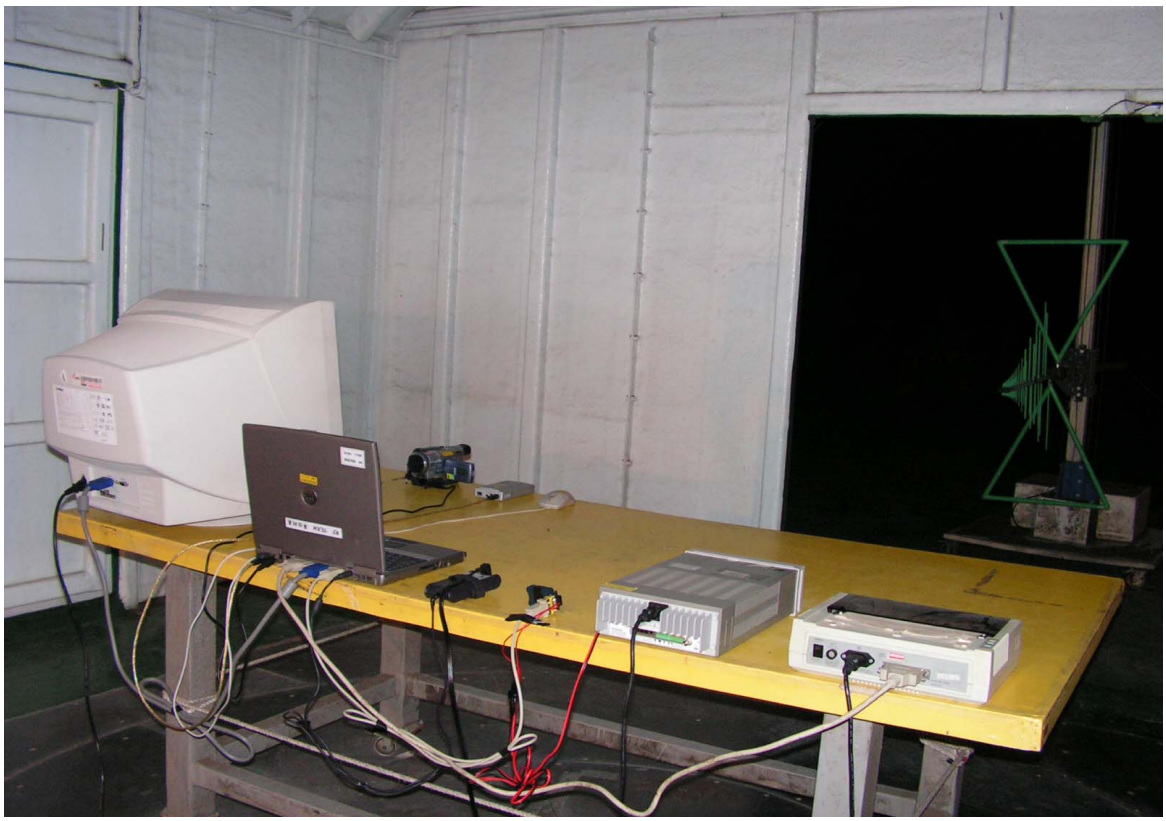
11.1 TEST PHOTOGRAPHS FOR CONDUCTION



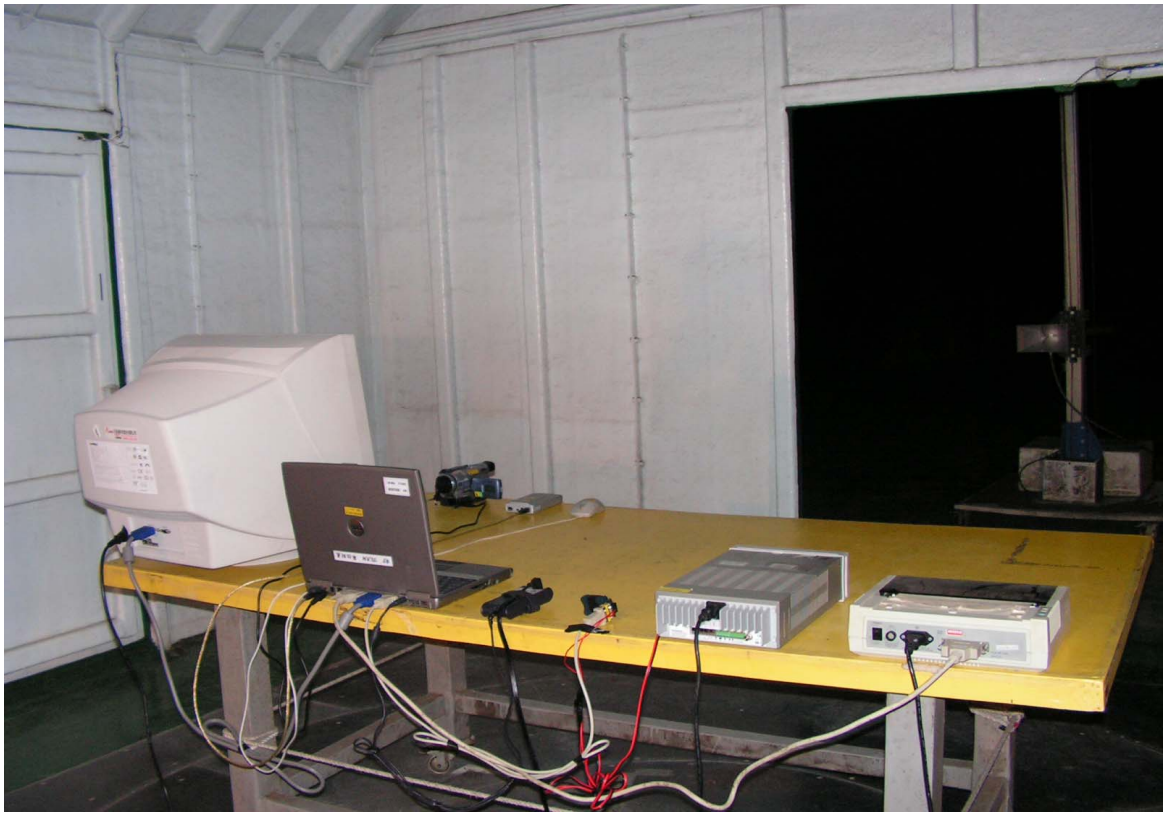
11.2 TEST PHOTOGRAPHS FOR RADIATION

30-1000MHz



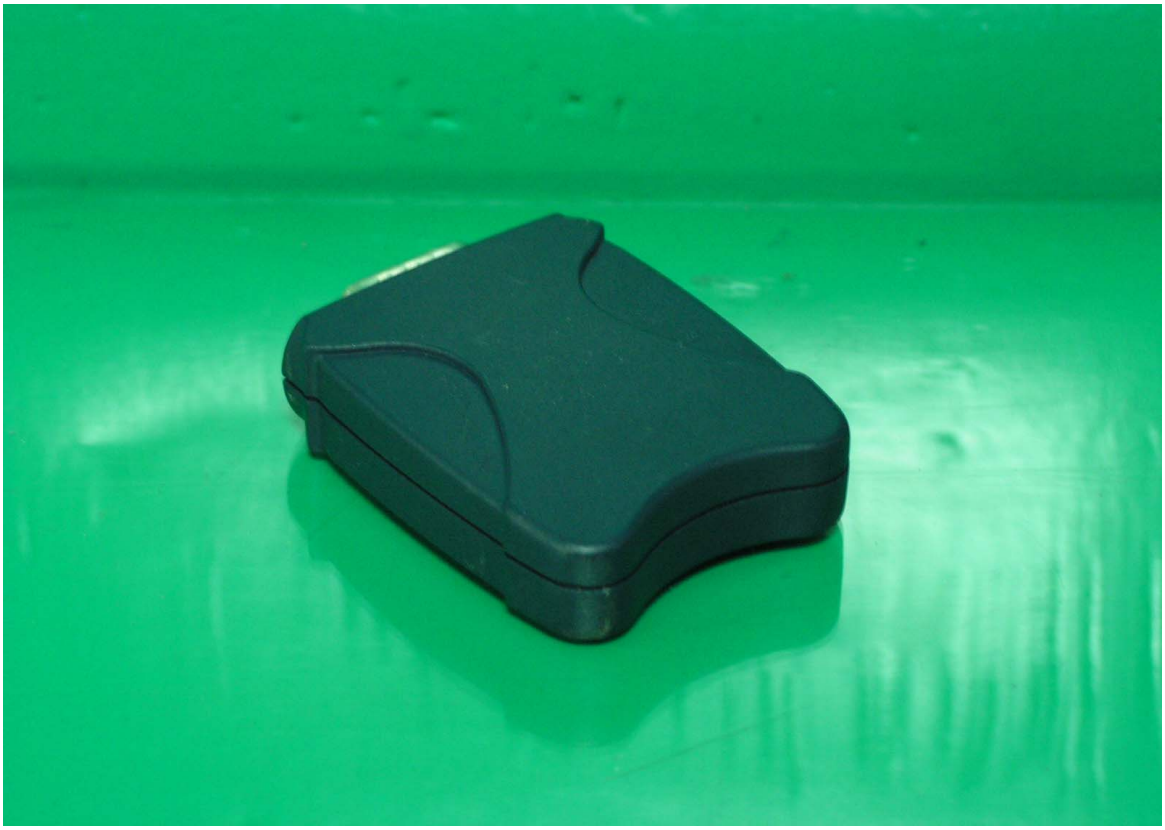


Above 1GHz

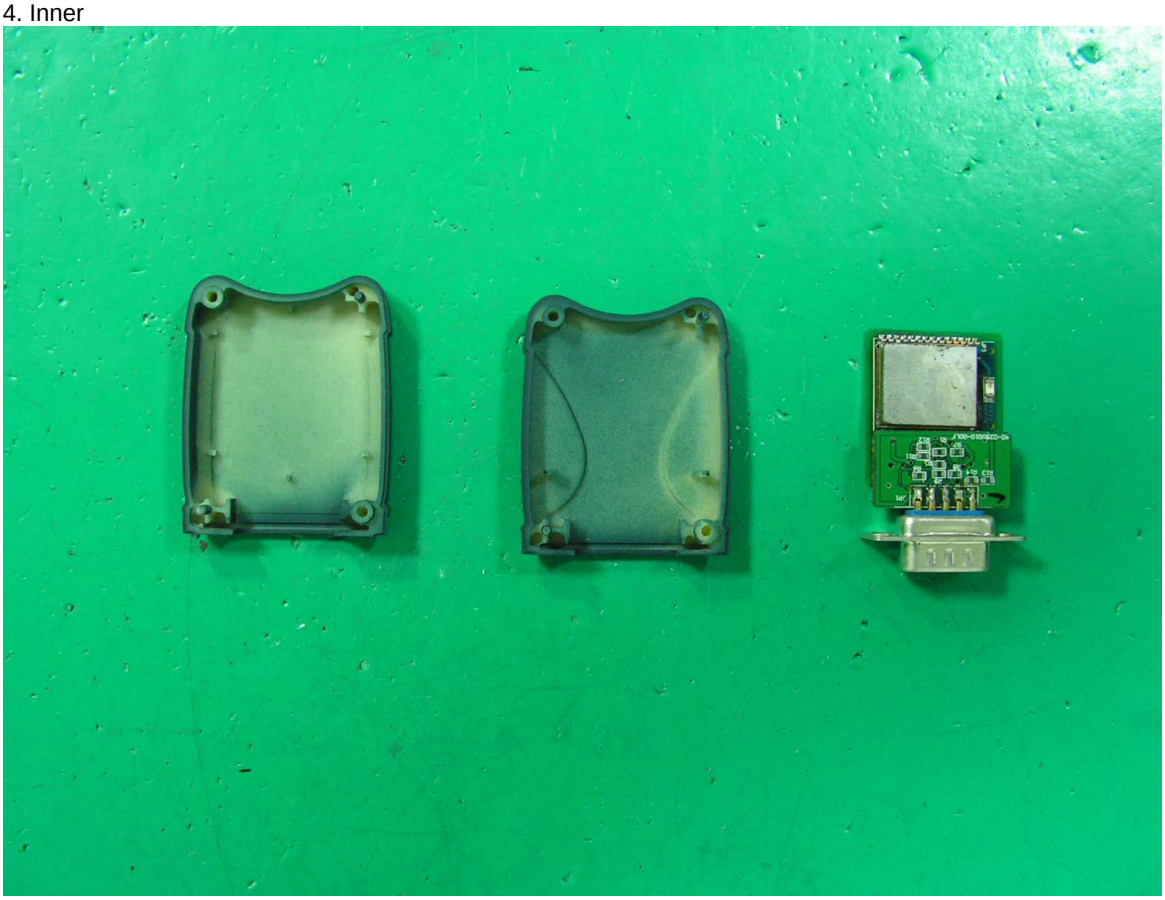


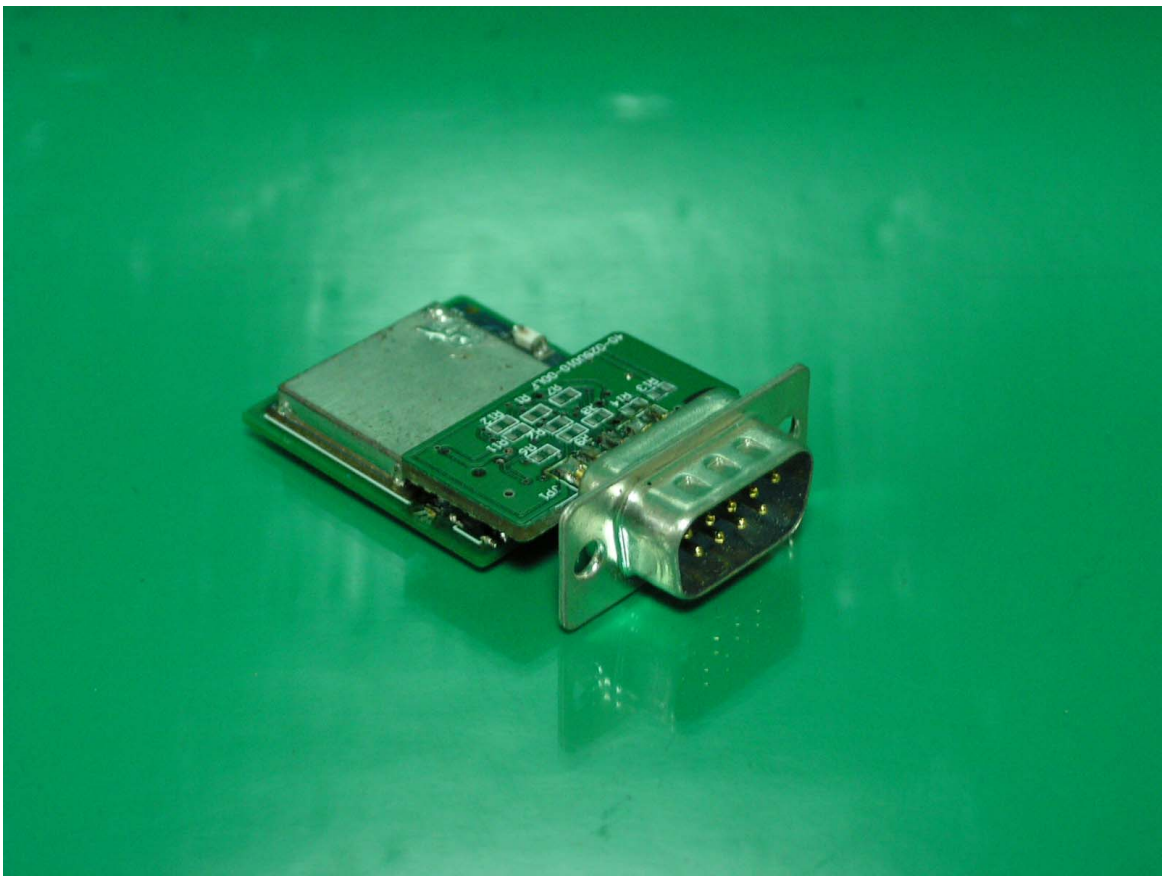
12. PHOTOGRAPHS FOR PRODUCT

1. Front View Of Bluetooth Module (EUT)
2. Back View Of Bluetooth Module (EUT)

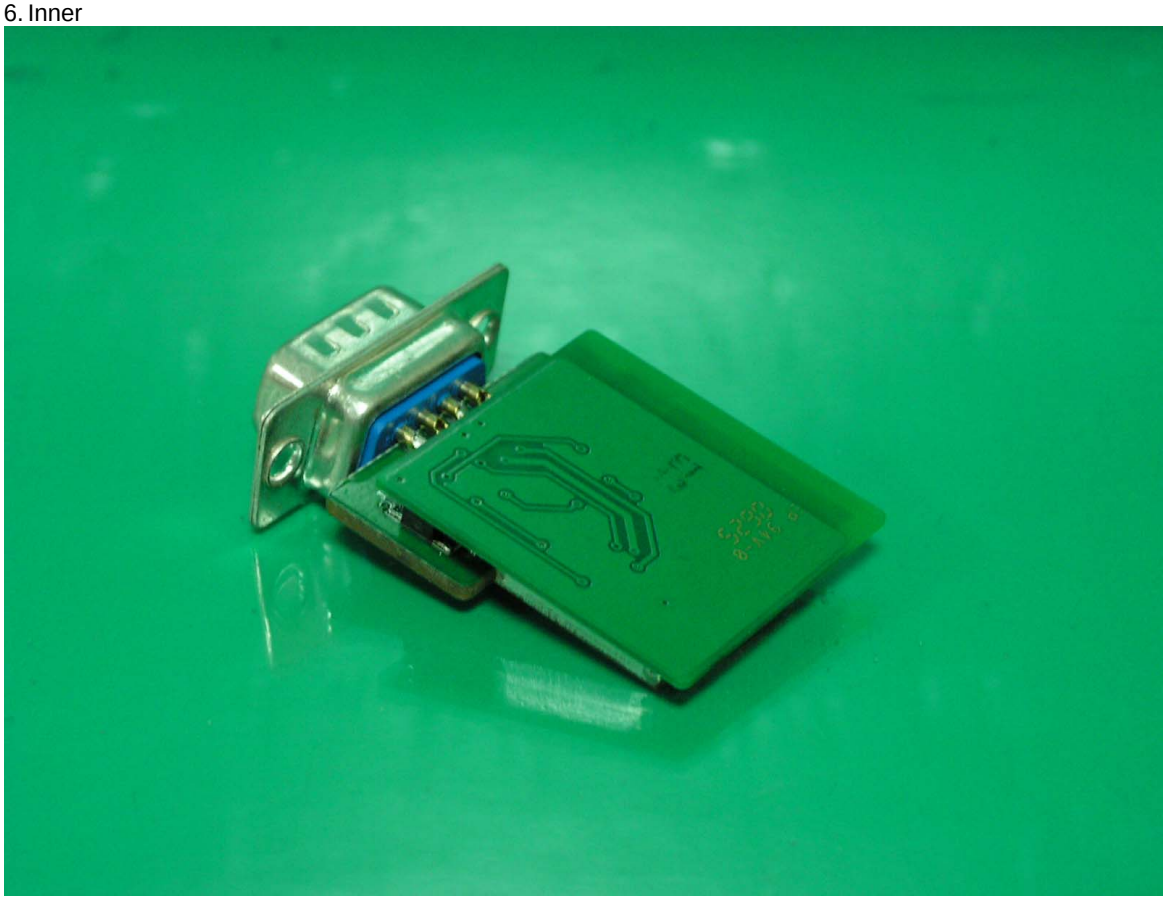


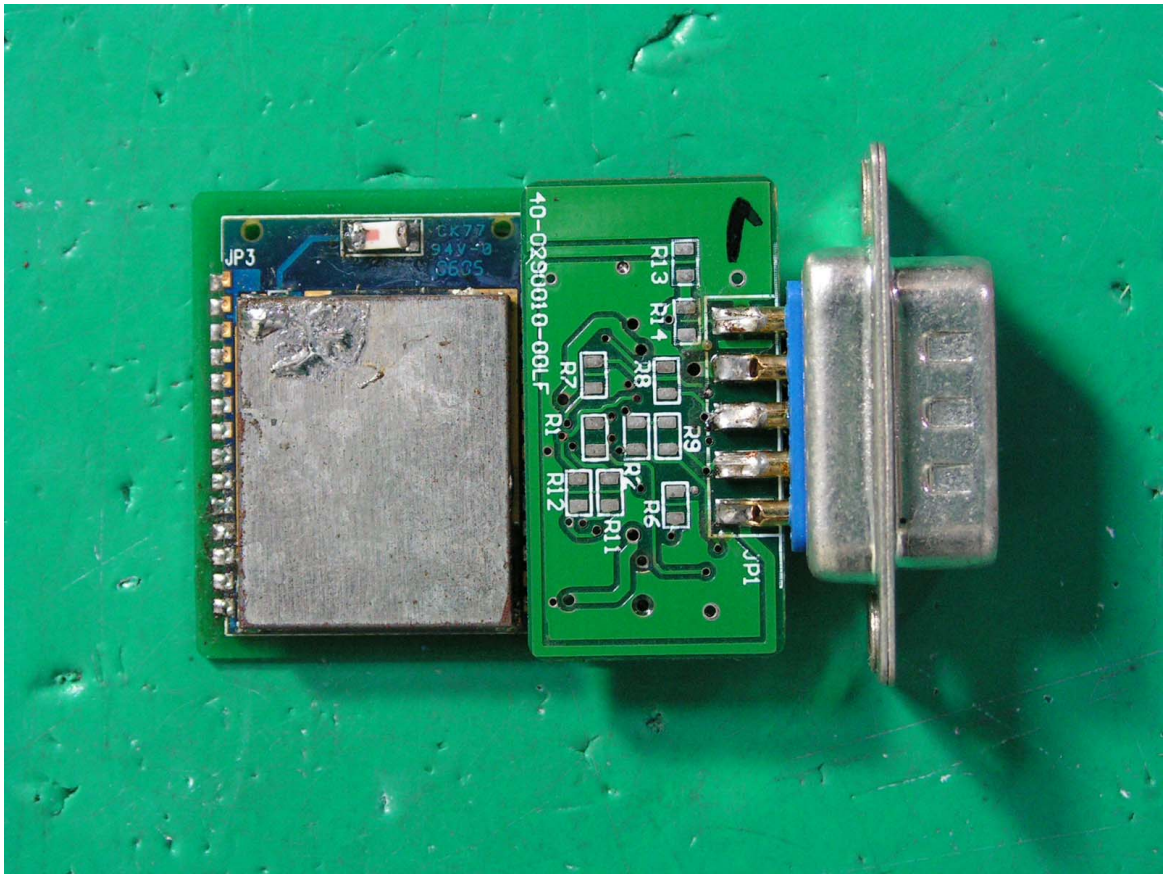
3. Inner
4. Inner



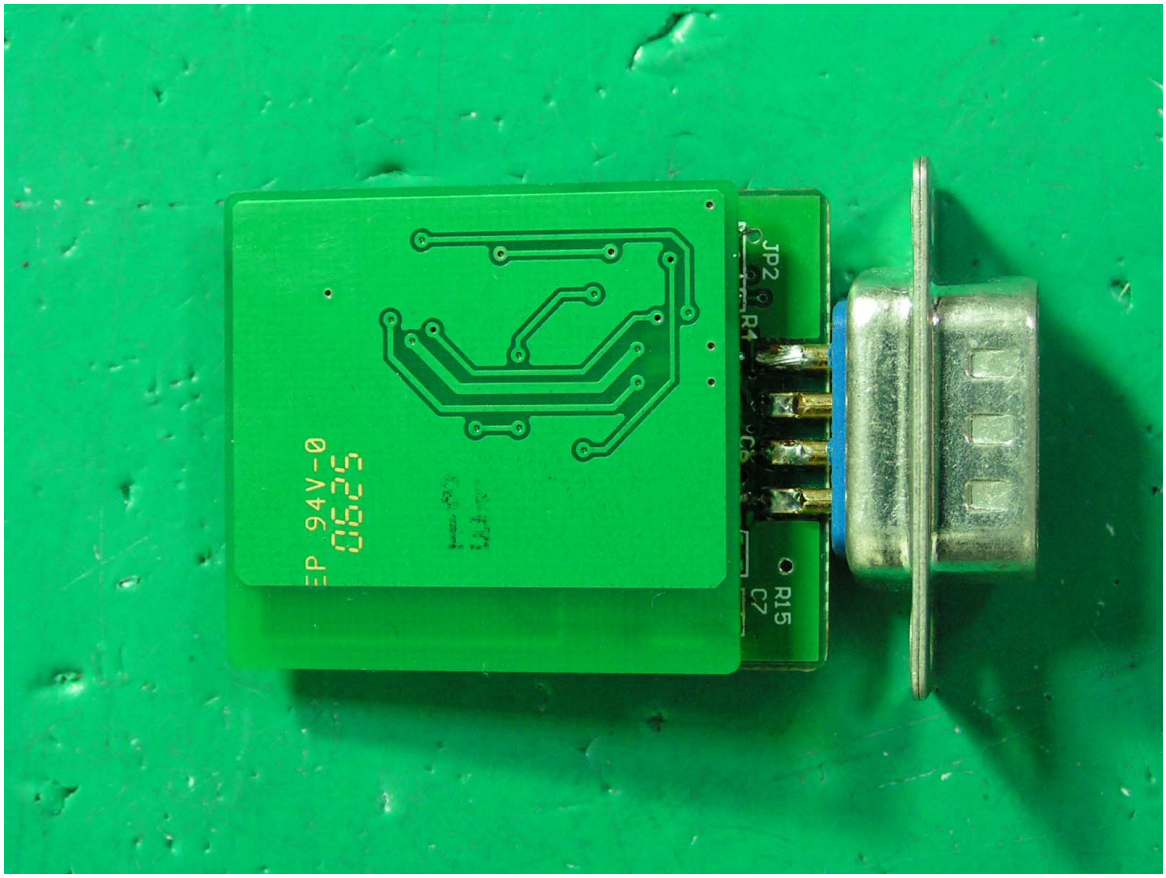


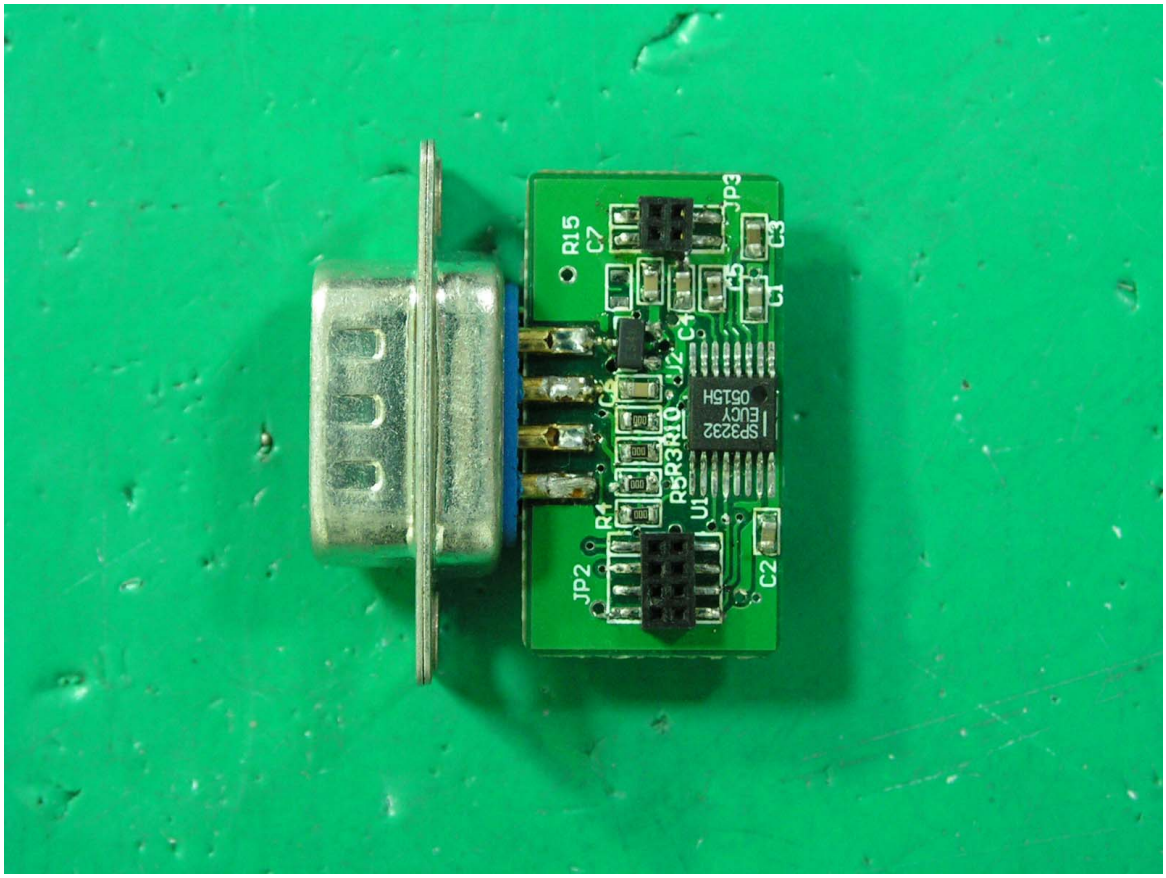
5. Inner
6. Inner



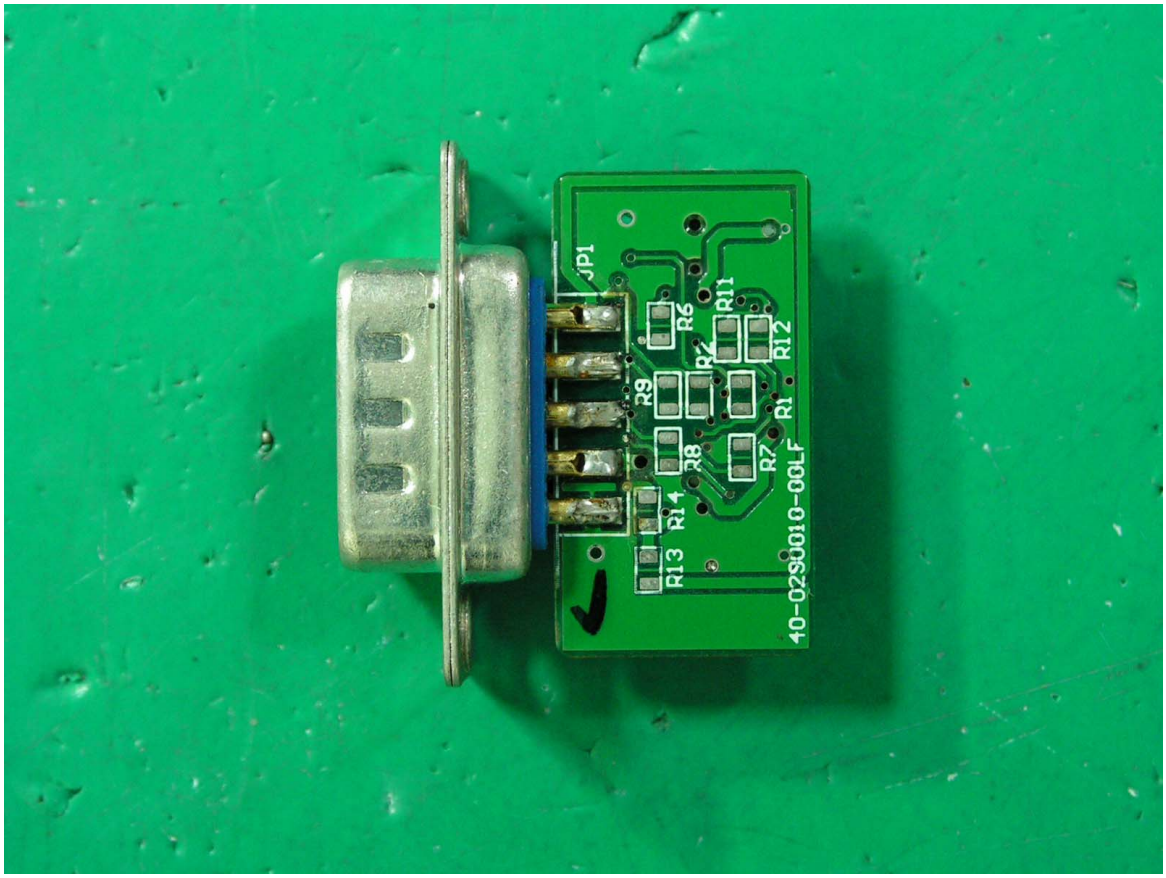


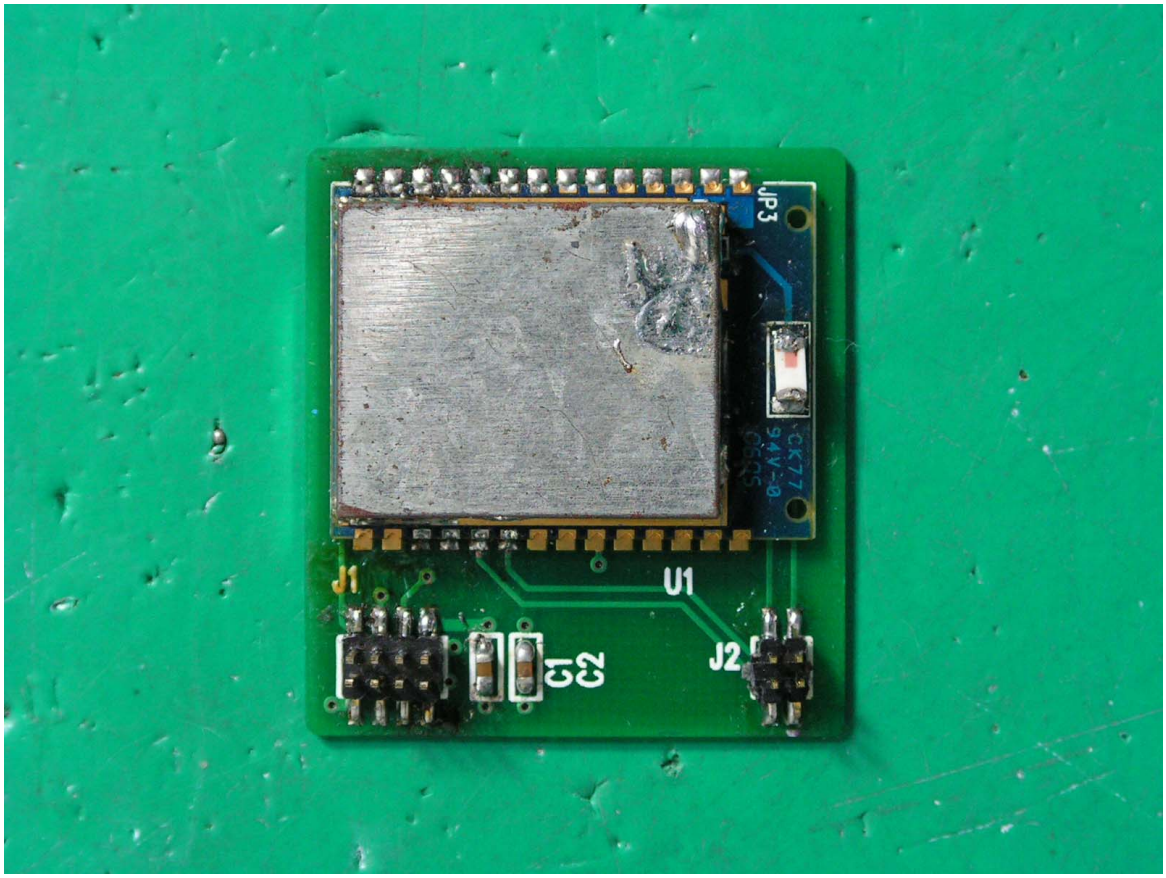
7. Inner
8. Inner



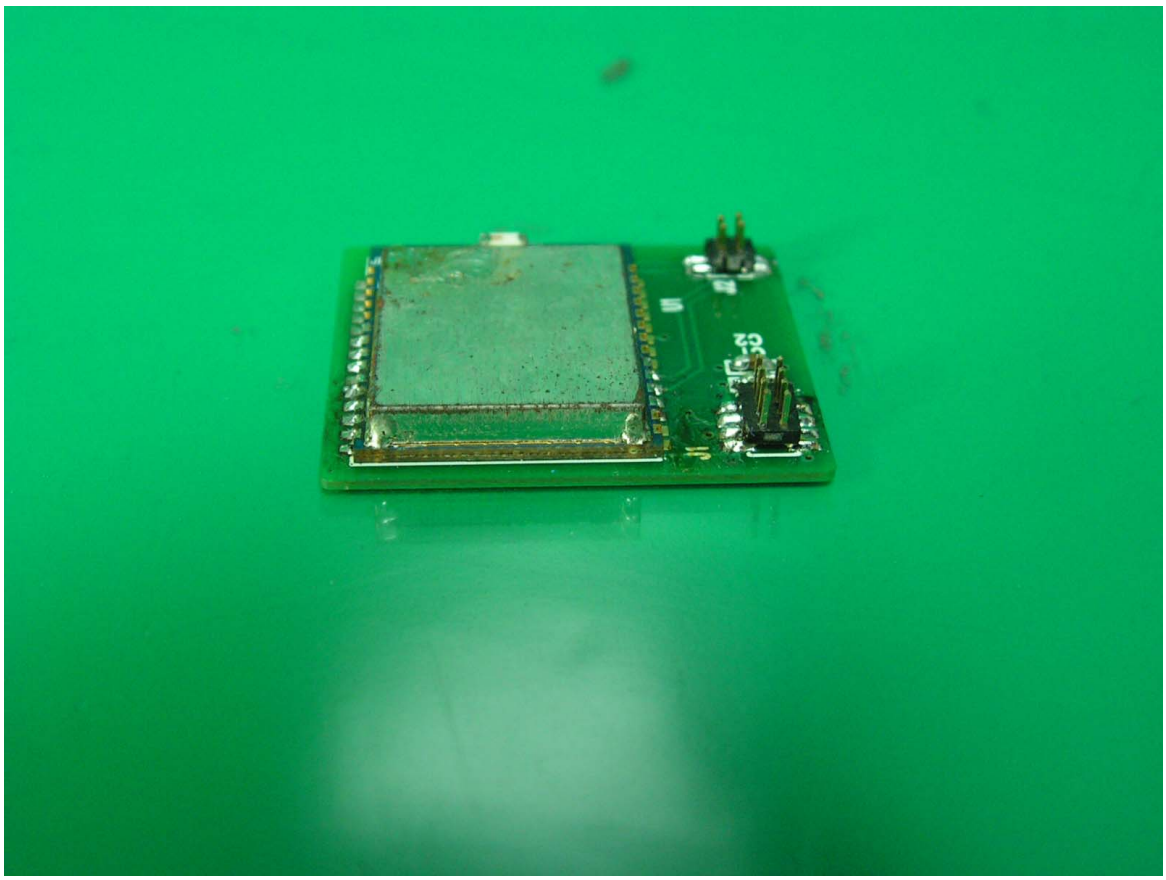


9. Inner
10. Main Board

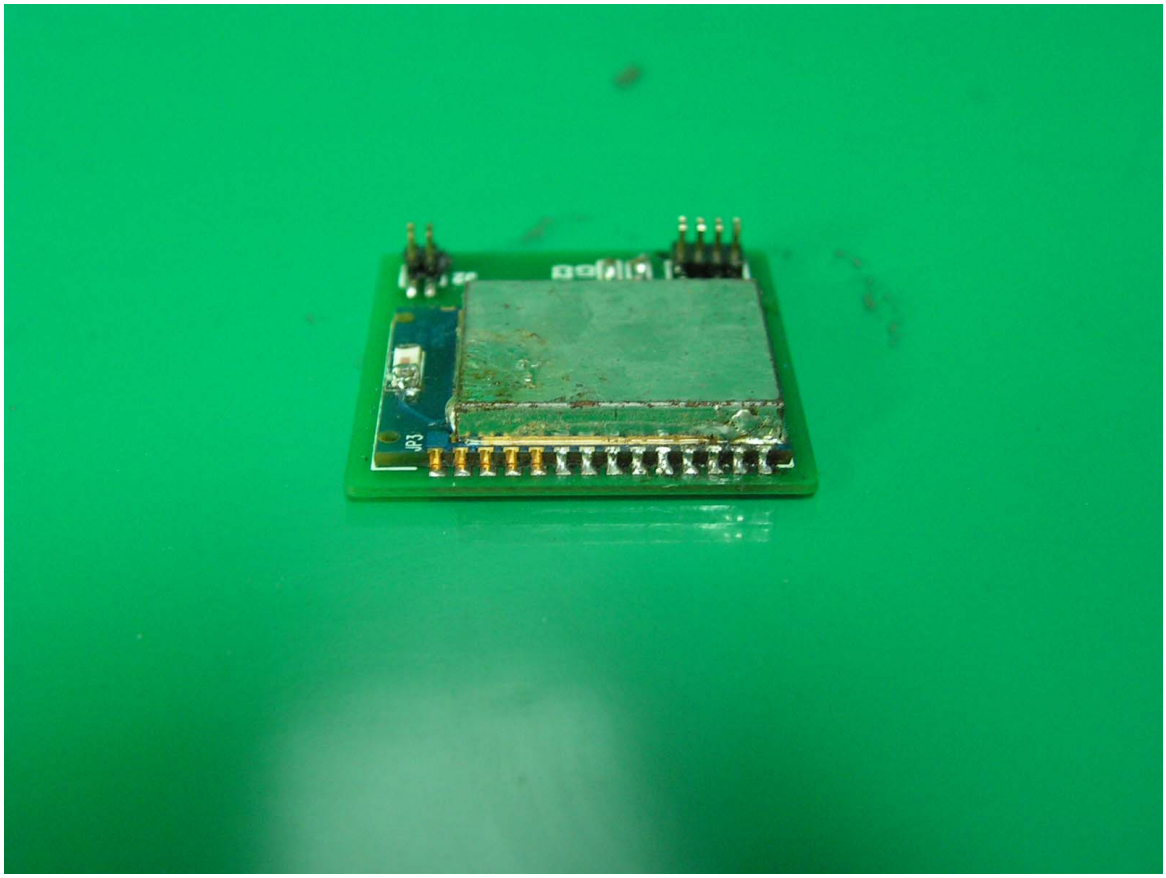


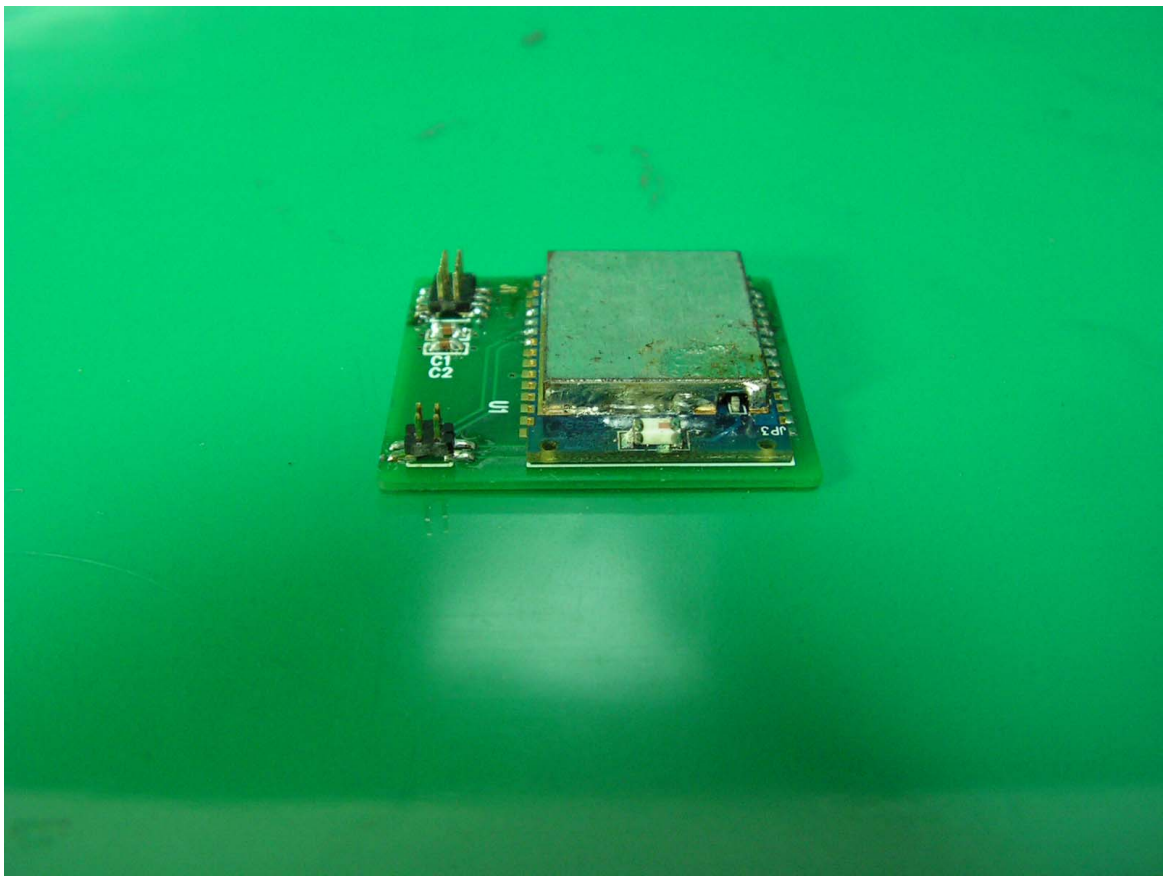


11. Main Board
12. Main Board

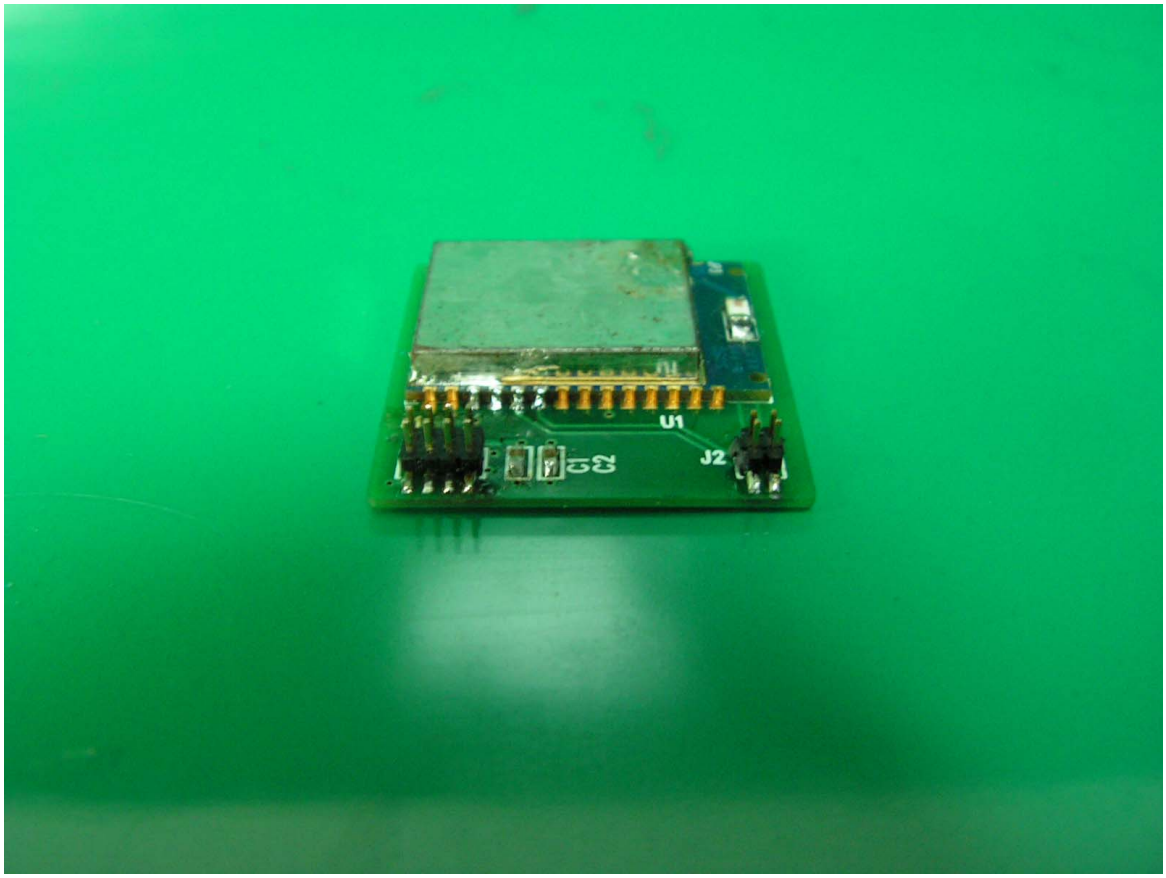


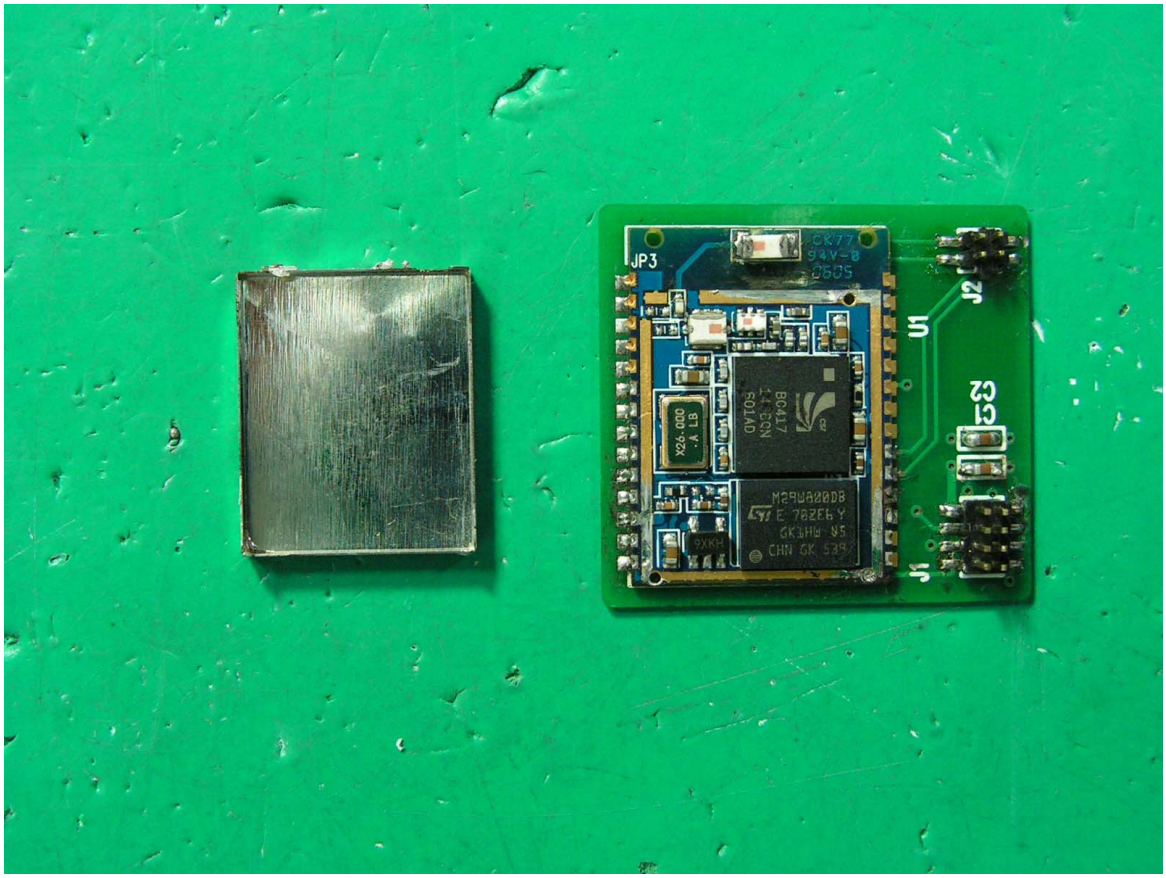
13. Main Board
14. Main Board



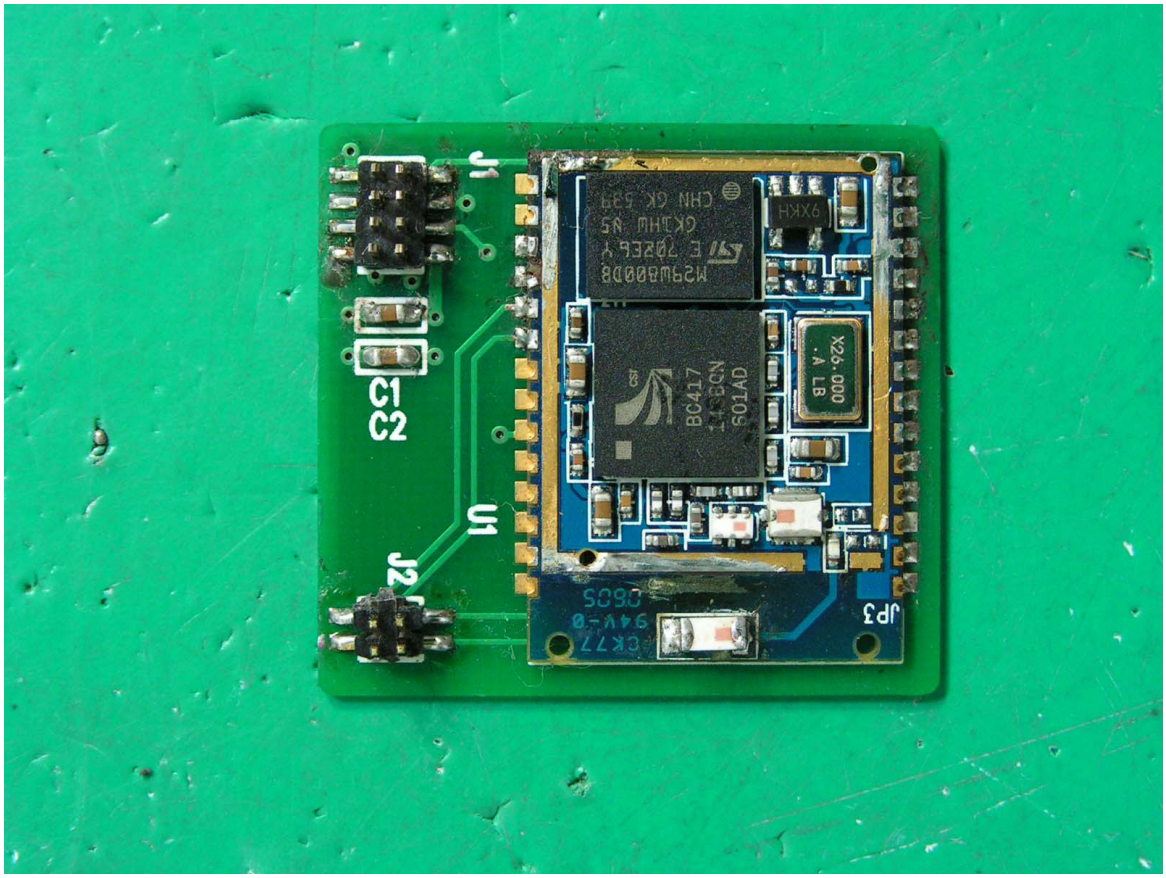


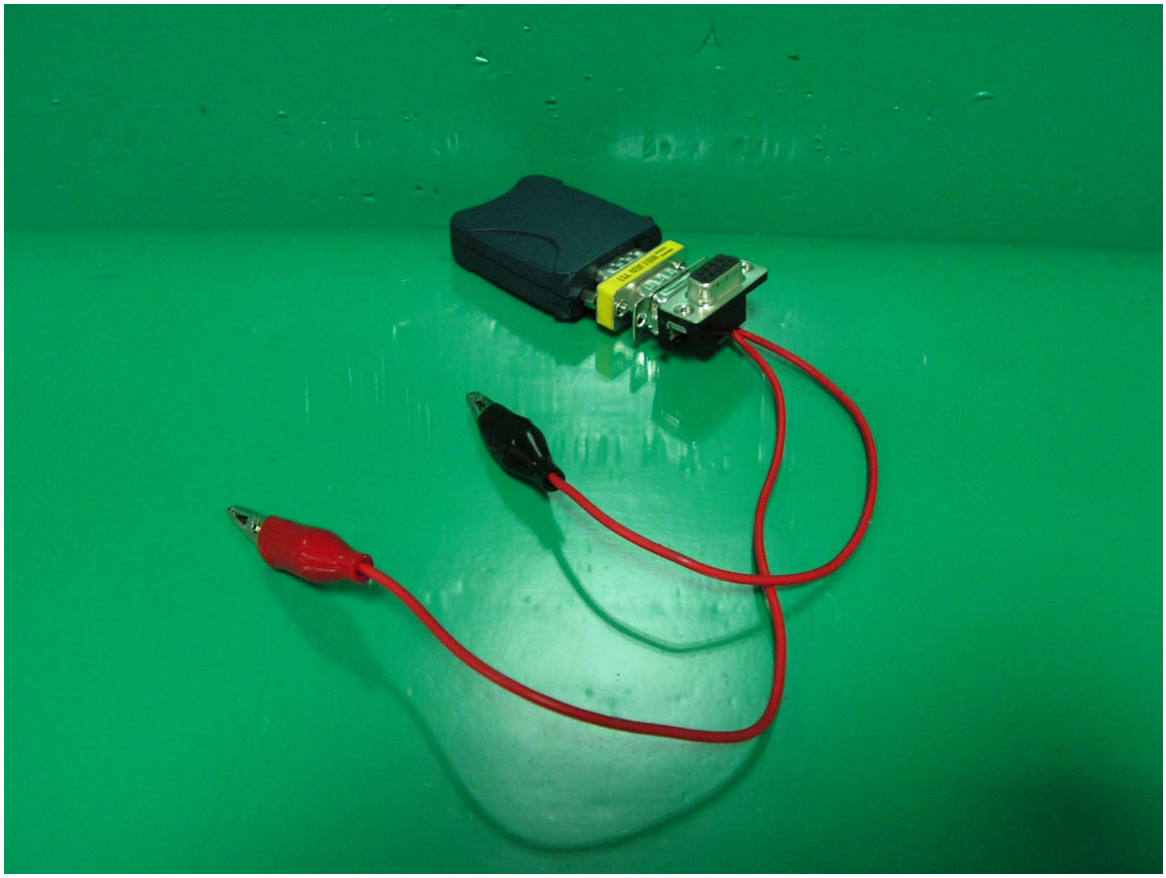
15. Main Board
16. Main Board



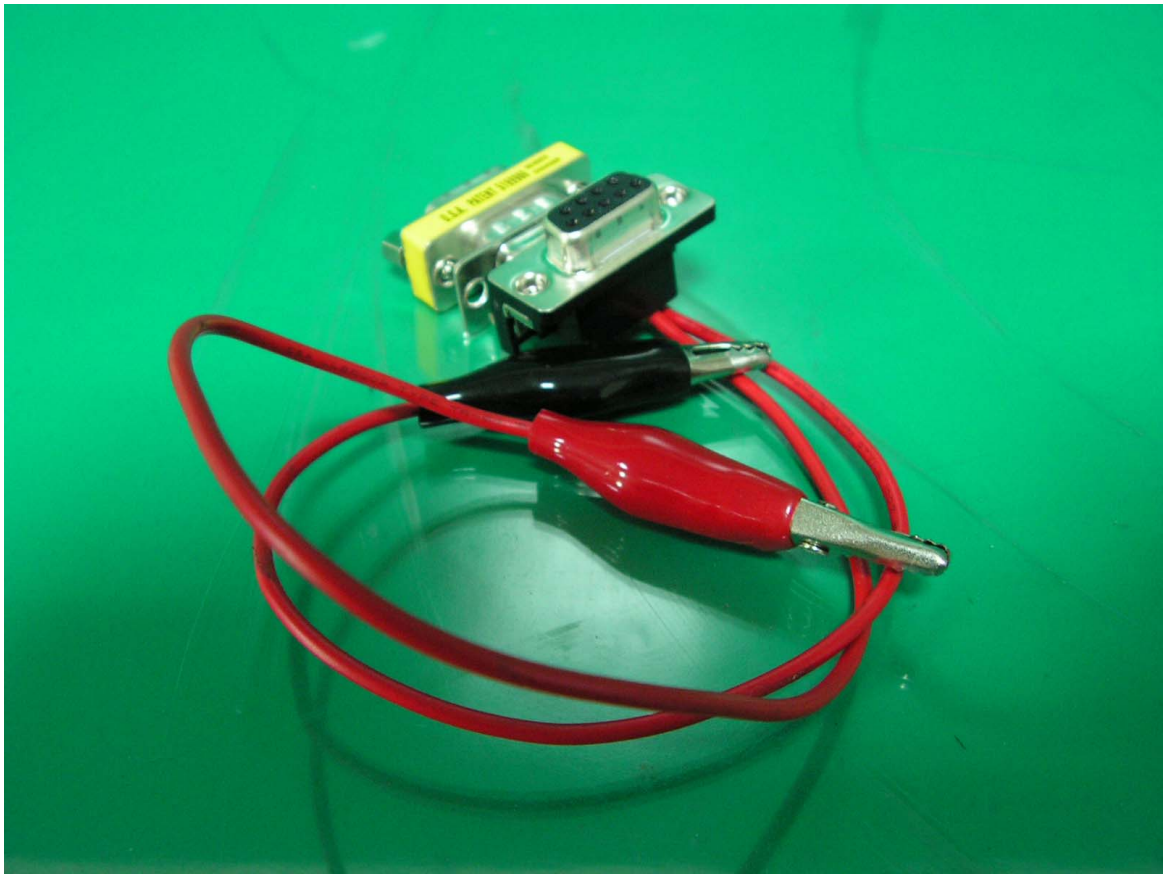


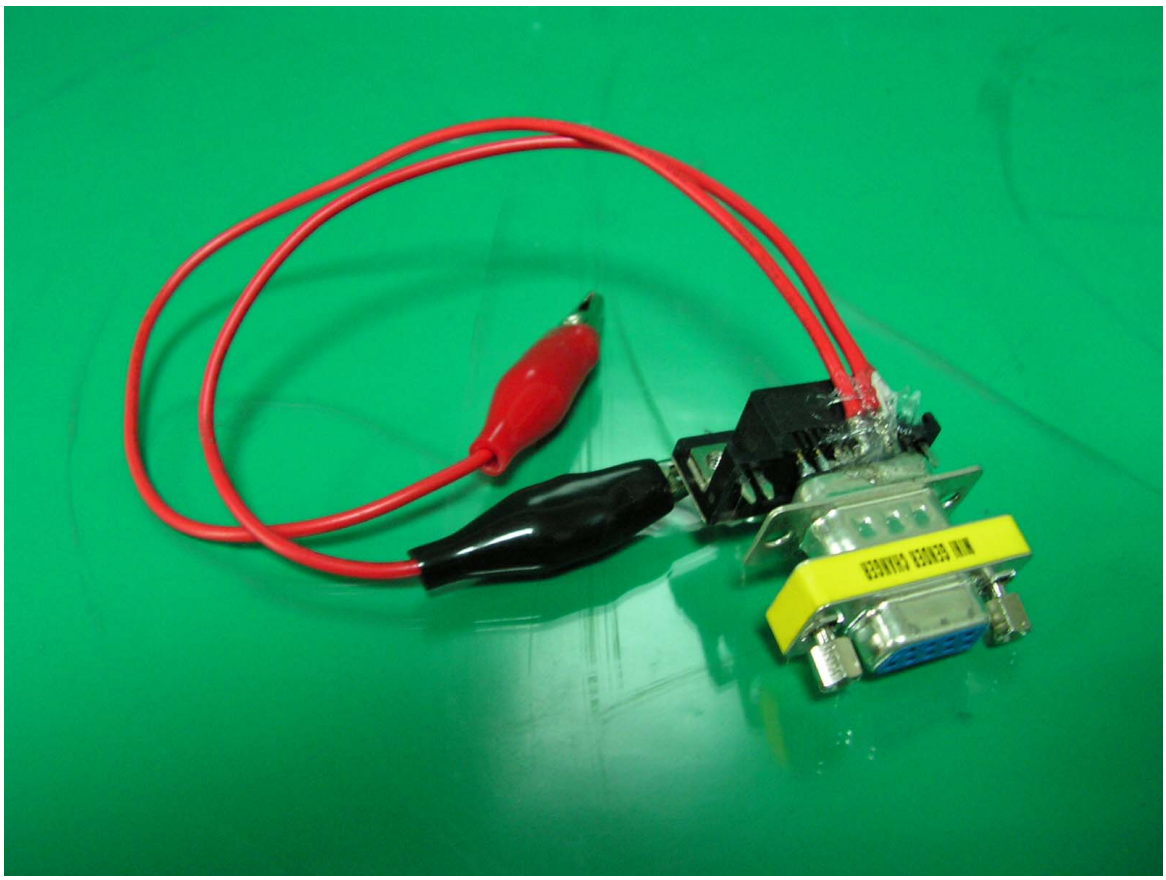
17. Main Board
18. EUT Test Fixture



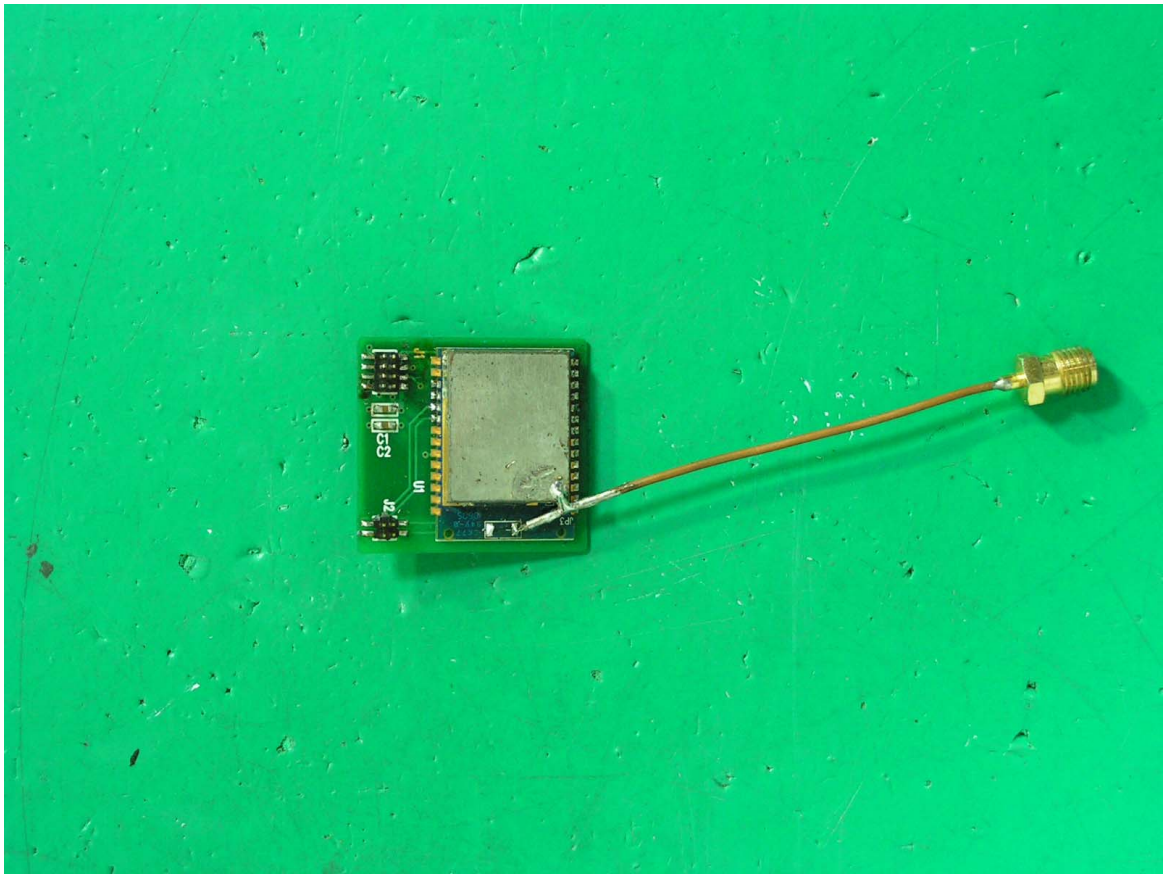


19. Test Fixture
20. Test Fixture





21. Test Porint of Conductive
22. Label Here



13. EMI REDUCTION METHOD DURING COMPLIANCE TESTING

No modification was made during testing.

Appendix A

Circuit (Block) Diagram

(Shall be added by Applicant)

Appendix B

User Manual

(Shall be added by Applicant)